ELECTRICAL REVIEW

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ELECTRICAL REVIEW

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2 SEPTEMBER 1955

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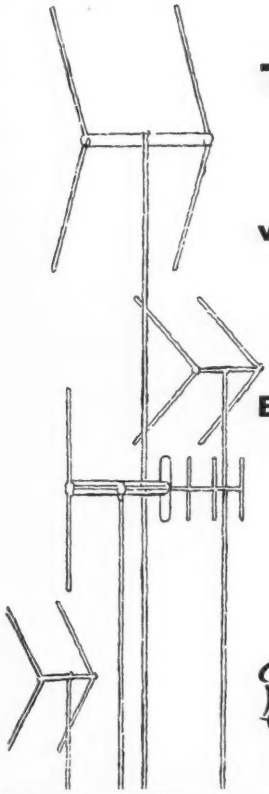

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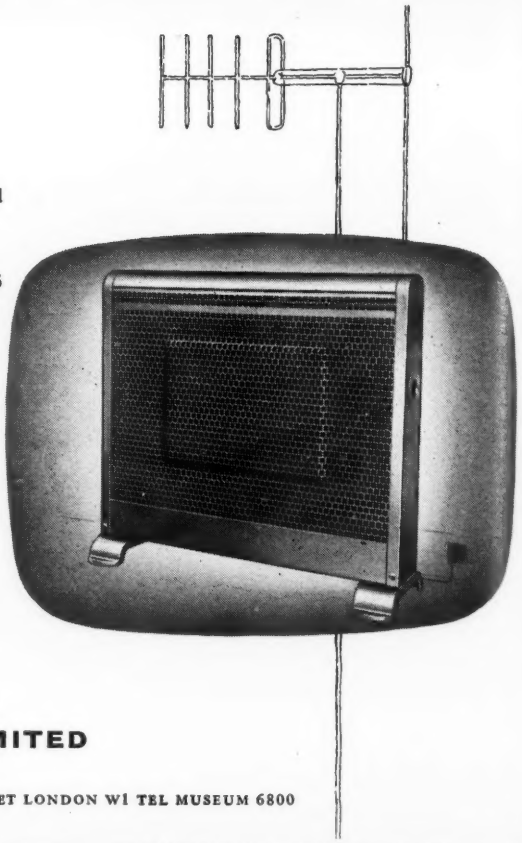

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ELECTRICAL REVIEW

2 September 1955 Vol. 157 No. 10 Established 1872

Colliery Electrification

THE conflict of claims for greater plant mechanization to raise output and for avoidance of interference with present output is probably more difficult to resolve in coal mining than in any other industry. Some indication of the reasons for delays in extending electrification was given by Mr. B. L. Metcalf (chief electrical and mechanical engineer, National Coal Board) in the paper which he presented at the recent British Electrical Power Convention, when he drew attention not only to the positive aids which electricity could bring to coal production but also to the reduction of waste of fuel it would bring about at the collieries themselves. As an instance, many of the 3,250 shell boilers there (more than three-quarters of them hand-fired) have to burn best washed smalls to maintain steam to meet increasing power demands.

In the use of electricity underground Mr. Metcalf gave first consideration to safety, which is very largely a matter of maintenance of apparatus in a thoroughly reliable state under the onerous conditions of limited space, high ambient temperatures, dampness and inevitably rough treatment. Safety is also the primary concern of the Principal Electrical Inspector of Mines, Mr. J. Cowan, whose report for 1952, which became available only last week, is reviewed in this issue. The statistics, up to 30th June of that year, seemingly of limited historic interest only, do at least show that increasing electrification over the previous ten years has not been accompanied by an appreciable increase in the number of accidents, a large part of the credit for which should go to the inspectors. It is all the more important, therefore, that their notes on accidents and recommendations for their avoidance should have immediate and wide publicity.

The report shows that many practices regarded as safe enough by electricians in individual mines may be evident to the wider experience of inspectors as potential sources of trouble anywhere. It is made clear, for instance, that some of the earlier remote-control circuits, once held to be satisfactory, are capable of igniting firedamp and should be replaced by those shown by recent research to be " intrinsically safe." Another point relates to unauthorized alterations not infrequently found to have been made in certified flameproof enclosures and intrinsically safe apparatus and circuits. Such interference may result in danger and in any case it invalidates certificates given by the Ministry of Fuel and Power.

More rapid coal production made possible by increasing electrification will be accompanied by greater concentration of power at the coal face, which will in itself enhance the value of sound maintenance procedure. This need will continue even with the advent of nuclear power, which for many decades will do no more than stabilize the annual fuel consumption by electric power stations at about 50 per cent above the present figure.

THE ENGINEERING EXHIBITION

For many years one of the outstanding things about the electrical industry in all its phases has been the remarkable way in which its influence permeates every aspect of our industrial life or, come to that, of life generally. It is doubtful if any event or function—national or world-wide—is broad enough to demonstrate really effectively this aspect of the universality of the electrical industry, but what is generally known as the Marine and Engineering Exhibition does so to a very remarkable extent. This year the Engineering, Marine and Welding Exhibition and the Foundry Trades Exhibition, which was opened yesterday at Olympia, London, and is surveyed in this issue, affords, as usual, a very broad representation of industry generally because nowadays all industries, particularly the production industries, have a strong engineering element. On the stands of the 500 exhibitors may be seen every possible type of electrical equipment—driving, heating, welding, control, etc.—and a vast number of their applications to engineering and industry generally. We urge every electrical man who can possibly do so to visit the exhibition, if only because of the broader picture of his own industry which he can obtain there.

ANOTHER REJECTION

For the third time in two years the United States authorities have passed over a tender for generators and transformers put in by the English Electric Co., although in each case that company has underbid American concerns. In the earlier cases it was suggested that the company was not in such a favourable position as the home manufacturers in the matter of service and repairs to the plant; this time the reason given is a possible adverse effect upon employment in the Pittsburgh area (in which the successful tenderer, the Westinghouse Electric Co., operates) if the order were placed abroad. It is not difficult to appreciate that American manufacturers who find themselves underbid will use all possible influence to secure the rejection of foreign offers, but it is not very encouraging to British firms who are constantly being urged to earn dollars—both by their own Government and the American Administration—to have their efforts frustrated. Although the United States Secretary for Defence has said that the present case is not to be regarded as a precedent, it looks as though previously-established precedents are being followed.

INDIAN STEELWORKS

Some anxiety had been felt lest Great Britain should not be invited to help in the expansion of the steel industry planned by the Government of India. Contracts had been awarded to the Russians and Germans and British chances did not seem too bright. Now it has been announced that the Government is favourably inclined towards proposals put forward by a consortium of British firms which was formed to negotiate with the Government on this subject. The British offer appears to provide for a works capable of producing one million tons a year and the cost is said to be in the region of £80 million. Electrical manufacturers here are closely concerned with the project for the modern steelworks demands a substantial amount of electrical driving plant and control equipment.

I.E.E. WIRING REGULATIONS

The new edition of the I.E.E. Wiring Regulations, the thirteenth, which came into force yesterday, goes further than revising the previous edition of 1950. A commendable simplification of its general arrangement is a division into two parts. The first part, which is reviewed in this issue, covers essential installation needs for securing safety of such a kind that non-compliance would justify refusal or cutting-off of a supply by an undertaking. The second part, dealing with detailed methods of meeting the requirements of the first, will form the subject of a further article next week.

IMPOSSIBLE DISCRIMINATION

The *Manchester Guardian* is sometimes unfair to the Central Electricity Authority and the boards of other nationalized industries. We think that this is the case when it criticizes the electricity and gas boards for raising money when the Chancellor of the Exchequer has appealed for restraint in borrowing. It was pointed out by the chairman of the Northern Gas Board that the two industries have been compelled to spend money on new plant and equipment by the pressure of customers' demands. The *Manchester Guardian* says that all industries are experiencing this pressure and suggests that customers' demands should be resisted. Does this mean that the gas and electricity industries are to refuse supplies or, at least, decide whether a supply should be given or not? It may be feasible for the banks to exercise this sort of discrimination but it would be impossible for the boards to do it—quite apart from the fact that it would be wrong in principle and *ultra vires* the boards without amendment of the legislation under which they operate.

TRADE WITH AUSTRALIA

Figures published in our last week's issue show that Australia's electrical import trade was not seriously reduced in 1953-1954; the total value of £A26·12 million was only £541,000 down on the 1952-53 figure. Of course in a period of rising prices and generally expanding trade even a small reduction is not satisfactory but it does suggest that measures of import control have not badly affected electrical import trade. So far this year Great Britain's electrical exports to Australia have shown improvement and, as we mentioned last week, Australia was the only customer to exceed the £1 million mark in July. It will be encouraging to British manufacturers to read that the Federal Treasurer, Sir Arthur Fadden, said last week that although Australia was suffering from an "economic strain" it was not the Government's intention to return to the business of controls. Even "inescapable" controls, such as import restrictions, were regarded as expedients to be dropped as soon as possible.

Electromagnets for Lifting

VARIOUS TYPES AND DESIGNS FOR SPECIFIC AND GENERAL PURPOSES

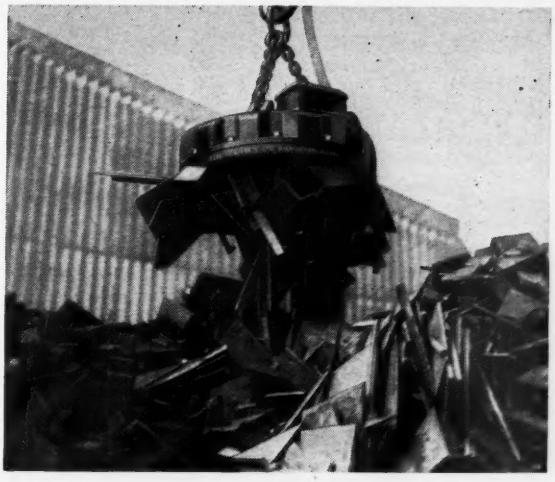
By J. C. GRIFFITHS

THE lifting electromagnet has been a servant of many industries for some considerable time but probably owing to its unspectacular appearance and complete lack of moving parts it attracts far less attention than its work deserves.

As with all types of electrical machinery, or indeed with any machinery, specialized types have been evolved each with individual characteristics best suited for the duties which it has ultimately to perform. It is proposed to deal with the leading designs and to give an outline of the classes of work to which they are usually allocated.

It must be borne in mind that it is not often possible to design an electric lifting magnet in the same sense that an electric motor or radio receiver is designed. When setting out to design an electric motor all factors are known quantities, i.e., amount of torque required and the desired speed, size of airgap between stator and rotor, frequency, duration and percentage of overloads, etc. In the case of a lifting design, the engineer admittedly knows the quality and magnetization curves of his steel in the magnet itself, but the permeability of his armature, i.e., the material to be lifted and the airgap likely to be encountered are capable of estimation only based on his practical experience. Rarely is the designer given the simple problem of producing a magnet to lift a perfectly machined flat block of known permeability and without airgap or even with uniform airgap.

Bipolar lifting magnet for ingots and billets



Circular magnet handling steel offcuts

Probably the most widely known type is the circular pattern seen suspended from crane hooks in scrap yards and foundries. The deep penetrating field of this magnet gives it a particularly wide application on many classes of materials, and it is the only design of magnet suitable for handling scrap, swarf, pig iron and other material lying around in disorderly piles where a good depth of field is essential to ensure a reasonable weight of material per lift. This essential characteristic of the deep impinging field is allowed for by concentrating the magnetic flux around the centre pole of the magnet so that a conical field is produced possessing considerable depth in relation to the energy expended in the winding.

The question is often asked: "What will a given size, say a 50in diameter lifting magnet, pick up?" The reply can only be given with any degree of accuracy when the class of material to be handled is known, for the magnet mentioned would easily pick up a flat block of steel weighing 10-12 tons but would find it hard to pick up 6 cwt of long steel turnings. Even so, because of the extreme difficulty of handling these awkward loads by any other means the tremendous amount of time and labour saved makes it well worth while to employ large magnets which will only pick up one-third of their own weight in scrap and swarf. Further uses for the circular type of magnet include the handling of "skull cracker" balls for smashing up old castings and transportation of very large irregularly shaped castings and ingot moulds, etc.

Closely following the circular magnet in popularity comes the rectangular type which is designed with quite different characteristics. Instead of endeavouring to produce a deep concentrated magnetic field around the centre, the designer arranges the rectangular type with a sensibly constant field strength over the whole of the lifting surface. This necessarily "shallows off" the depth of the magnetic flux, but this is relatively unimportant on the duties for which this type of magnet is used. These duties include

the handling of steel plates, sections, rails, tubes, bars and other types of materials stacked in an orderly fashion and on duties of this type good lifts are obtained with a moderate expenditure of power. Furthermore, when exceptionally long lengths are to be handled the rectangular magnet is very suitable for building up into multiple assemblies consisting of magnets fitted to a spreader beam. Owing to its relatively shallow field this type of lifting magnet is quite unsuited for handling swarf, mixed scrap, loosely stacked iron pigs and skull cracker balls.

The third most widely used magnet is the so-called bipolar type which gives a high lifting efficiency on very heavy loads with reasonably flat faces such as large ingots, billets, castings and rails, etc. This class is also very useful for handling black hot ingots and billets, as it is a relatively easy matter, due to the coil design, to keep the heat away from the coils and thus prolong the life of the windings. It is definitely unsuitable, because of its mechanical design and type of field, for handling small stuff which is much better dealt with by circular, or occasionally by rectangular, types.

The foregoing gives a very brief general idea of the major types of lifting magnets and their applications in industry and consideration is next given to methods of securing the necessary energizing current. D.c. is universally used as this enables solid steel field systems to be used which assist in giving great physical strength and the maximum amount of flux which is, of course, completely steady. The use of a.c. would presuppose laminated field systems to avoid eddy currents and consequent overheating. This would increase production costs and introduce great difficulties as regards attaining mechanical strength and rigidity to stand up to the heavy service which is the unfortunate lot of nearly all this apparatus. It is normal to use a voltage of about 220 for reliability and a good space factor and windings based on this make a good compromise between these two factors and permit of reasonably sized cables and controller contacts.

In few cases is d.c. available on site and it is often necessary to provide some type of convertor. The two most widely used methods are rotating motor-generator sets using squirrel cage or wound rotor type driving motors and level compound wound generators or alternatively static apparatus in the form of rectifiers, almost always of the metal oxide type, combined with transformers to step down the mains voltage. For mobile cranes it is necessary to provide diesel or petrol driven generating sets mounted on the crane itself unless the crane manufacturers have provided sufficient generating capacity in the original design to energize a magnet.

Special rectangular magnets for lifting bundled tubes or bars

There is also the problem of conveying the d.c. from its source to the magnet itself and this is normally arranged by providing collector wires and spring cable reeling drums. It is obviously beneficial to mount the source of d.c. supply as close as possible.

Dealing next with systems of control, the most widely used type of controller employs a robust selector switch with "lift," "off" and "drop" positions which actuates contactors mounted in a separate housing or casing. The "lift" position places the magnet direct across the supply line and so gives maximum flux density and thus maximum lift. When it is desired to drop the load it is not quite sufficient to switch the magnet "off" due to the fact that the magnetic flux takes a measurable time to decay and this factor, combined with remanent magnetism in the materials being handled means in practice that quite a few seconds elapse before the load is dropped.

It is thus necessary to move the selector lever into the "drop" position which feeds in a reduced voltage of opposite polarity which breaks down the remanence and rapidly reduces the flux to zero or nearly so. The load drops smartly and the selector lever returns to the "off" position under the influence of a spring. A further feature is invariably incorporated to limit the voltage rise when breaking circuit. A lifting magnet possesses a very high inductance due to the large number of turns, the iron circuit and the relatively large currents involved and the sudden rupture of such a circuit would produce dangerously high voltages with consequent risk of breaking down the insulation. To avoid this effect a non-inductive resistance is shunted across the windings at the instant of breaking circuit and the voltage is consequently limited to a safe value. This type of controller is used when handling scrap, swarf, ingots, thick heavy plates and in nearly all applications where it is desired to pick up the maximum lift in the minimum of time.

Selective Magnets

The need for a certain amount of selection is often felt, as for instance, when it is desired to lift one plate off a stack or to pick up a partial load of pig iron. Series resistance types of controllers and potentiometer controllers have achieved a certain degree of success on these applications. It is also useful to have control of the magnetic flux from a safety viewpoint, as when handling thin plates or sections. In such cases it is quite probable that the lower plates in the pile being lifted would not be securely seized by the magnet should maximum voltage be applied immediately. It is therefore advisable to drop the magnet on to the pile or stack, apply, say 50 per cent of full voltage, lift the load clear of the stack and then apply full voltage which securely and effectively clamps whatever the magnet has lifted. These operations can, of course, be readily performed by introducing series resistance into the feed, and controllers embodying this, together with the reverse current "smart drop" device, are widely used.

Resistances inevitably waste power and occupy space so that a system which avoided such inherent defects and gave a much wider range of selectivity would obviously have much to offer. One firm of manufacturers has patented a scheme which gives a range of control from zero to maximum magnetism in about 40 steps without

the use of series resistances. Briefly the system comprises a special 40-step controller which is used in conjunction with a motor generating set and regulates the generator output from zero up to full voltage in 40 steps.

A very fine gradation of lifting or dropping power is conferred accordingly, the power input to the driving motor on the m.g. set being roughly proportional to the power fed to the magnet. No discharge resistances are necessary as the circuit cannot be broken on high voltage and the quick discharge reverse current feature is, of course, embodied. Such a control system is extremely useful when applied to circular lifting magnets on cupola charging where the ability to pick up or discharge small amounts of different grades of iron materially facilitates making up the charge. A flush current device is built into the controller which gives the magnet a momentary boost with consequent increase in lifting power when it is desired to shift materials in bulk with the greatest possible despatch. An example of this occurs when quick unloading of scrap from railway trucks or lorries is desired.

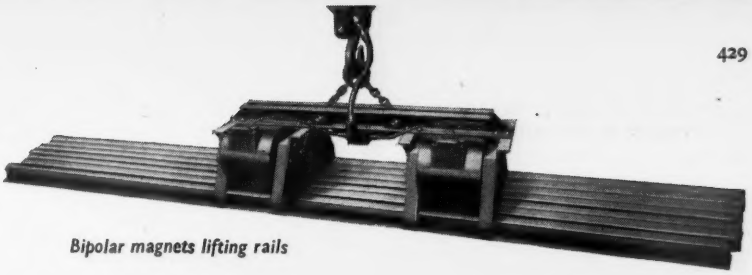
The scheme is also of great value when it is necessary to select thin steel sheets individually from stockpile and when used with rectangular magnets of suitable design it has been proved capable of selecting ¼in thick steel plates and this without sacrificing the ultimate lifting power of the magnet on heavy plates of considerable size or weight.

So far a fair amount of application detail has been covered but little has been said about general design. A lifting magnet must possess two features above all: the ability to handle the greatest possible load, and exceptional mechanical strength. The performance is governed by the proportions of steel and copper used and the shape and material of the magnetic path; the designer obviously employs these to the best advantage and he makes full use of asbestos and glass insulations to improve performance and reliability. The magnet shells are manufactured from high permeability steel castings, heavily reinforced to withstand the impacts received in service and the magnet coils are amply protected by robust bumping plates strongly ribbed where necessary to resist shock and abrasion.

Terminal boxes are well protected and of ample substance to withstand the hard knocks received in service. The coils are invariably fireproof insulated and suitably impregnated. The whole general construction is weatherproof as many magnets spend all their working life in exposed positions subject to polluted atmosphere and all conditions of weather.

Maintenance is small and there are no moving parts. A greasing and routine inspection of sling chains, shackles, pins, etc., is naturally a *sine qua non* as these components are subject to heavy wear in service. A periodical tightening of screws and bolts should take place and the glands, cables and cable couplings should receive periodical inspection for watertightness, deterioration, chafing, etc. Never should a magnet be left with a broken terminal box lid or defective cable glands as this invites the ingress of water, nor should a magnet be left energized when it is not actually lifting.

The control gear, spring cable drums and generators should receive the normal maintenance schedule for electrical control gear and rotating machines. All gear designed for use in conjunction with lifting magnets is of heavy duty construction but it does appreciate a little maintenance from time to time. Oil immersed rectifiers are particularly robust and trouble-free equipments and the only maintenance normally required is an occasional check on oil level and topping up if necessary. No doubt the conscientious user will insist on changing the transformer oil at regular intervals.



Bipolar magnets lifting rails

Rectangular magnet for plate handling

The applications mentioned in the earlier part of this article are those upon which lifting magnets are most generally used, but it should not be thought that they represent in any way the limit of their capabilities. Many special types have been evolved for other duties. For instance, a firm manufacturing large oil drums wished to speed up the processes in manufacturing the drums and examined the possibility of actually offering the partially finished drums to the forming machines by means of lifting magnets instead of by purely mechanical means. A special form of magnet, based on a rectangular, even field design was soon evolved and these proved capable of handling the oil drums in an extremely efficient manner. Although the gauge of steel from which oil drums are manufactured is light and does not present an ideal armature, a little thought given to a special design soon overcame the problem in a most satisfactory manner.

In another instance a heat treatment shop wished to transfer heated components quickly into an oil quenching medium and then, with the minimum delay, remove the quenched components from the medium. In this case a special oil-tight magnet, resistant to high temperature, was produced and has now been at work for some years with every success and satisfaction.

Sometimes quite small lifting magnets help to speed up production and relieve fatigue in operation. One large commercial vehicle manufacturer was confronted with the problem of offering up differential assemblies (with crown wheel and pinion) into the back axle casing which was held in a fixture. The differential assembly weighed some 130 lb and caused great fatigue to the operator who had to pick it up off the bench and place it in the housing, locating it upon the studs in the back axle banjo at the same time. The magnet designer solved this problem very simply by supplying a small diameter deep field lifting magnet which safely and easily lifted the differential assembly on point contact. Then with the aid of a small

pneumatic hoist and runway, the operator transferred the differential to the back axle casing and placed it without damage, thus increasing production.

Special watertight magnets have been produced for salvaging ore from the sea bed and have functioned well for years in spite of pressure and corrosive conditions.

In steelworks the need often arises to handle black hot ingots which obviously cannot be approached to allow for any form of manual handling and to enable handling to be carried out with the minimum of delay a special type of heat-resistant magnet was evolved which allowed for handling the ingots without waiting.

The foregoing represent only a very few of the many applications for which electromagnets are in daily use, but it is hoped that those chosen for mention will help to illustrate to the reader how diverse are the uses for these silent servants of industry. New uses and applications are coming up for consideration almost daily and it is reasonable to suppose, in these days of automatic handling, that their sphere of usefulness will continue to expand.

The E.C.A. Specifications

By T. C. GILBERT, M.I.E.E.

IT is known that the Technical Committee of the E.C.A. gave considerable time and thought to the preparation of its " Standard Specifications for Electrical Installations in Small Houses," and these have received a warm welcome and approving comments in the technical Press. There is no doubt that some simple standard of this kind has been needed for years, and it may now seem churlish to offer criticisms of these well-meaning efforts; however, as an old contractor it does seem to me that any lurking adverse comments should be aired now, especially as it is likely that further specifications may be issued in the future, possibly covering larger jobs.

In the first place, these specifications apparently visualize no departure from t.r.s. and v.r.i. cables. Many architects are now specifying the newer p.v.c. insulated and sheathed or polythene insulated and p.v.c. sheathed assemblies in order to overcome two drawbacks inherent in t.r.s. cables—high inflammability and limited life, especially where they are exposed to sunlight or ozone. The E.C.A. would appear to be accepting considerable responsibility in now trying to standardize t.r.s., which to the writer's mind is a definitely retrograde step.

One great problem facing the industry at the moment is what to do about ageing installations: leading engineers have expressed concern about the fire risk. It has rightly been said that we build houses to last a hundred years and put into them electrical installations that are really good for only thirty years, leaving the house owner faced either with a continuously dangerous wiring installation or the heavy expense of rewiring. Apparently this deterioration is most likely in two directions: (1) rusting or corrosion removing sections of steel conduit and thereby destroying continuity; and (2) the inescapable limitation of life of rubber insulated cables. Yet these two drawbacks are inherent in the systems recommended in the specifications.

It is not to-day impossible to make non-ageing installations; although the specifications completely ignore the existence of non-metallic conduit, the Committee must surely have known that many contractors and Area Boards are now using p.v.c. conduits with p.v.c. cables in making what are confidently expected to be completely age-proof wiring installations, and with considerable saving in costs as compared with heavy gauge conduit installations.

Earthing Methods

The writer is very unhappy about the alternative earthing arrangements. It is stated—" Should it prove subsequently that alternative arrangements are necessary, a 60-amp D.P. switch with earth leakage trip shall be fitted and such switch shall take the place of the 60-amp D.P. switch of the main control. . . ." It seems very difficult to get our friends the contractors away from the idea of using the leakage trip as a main switch, but this rather uninspired practice inevitably ensures that with the occurrence of an earth fault—possibly of minor importance, such as the boiling over of liquids on to exposed elements—all lighting will be extinguished immediately, not just the section usually lost when a sub-circuit fuse blows, but all sockets and all lighting dead as doornails.

This very important aspect of leakage protection was raised by Mr. H. W. Swann, M.I.E.E., in his recent I.E.E. paper—" Domestic Electrical Installations—Some Safety Aspects "—in the following words—" It may be said that a consumer who is protected by only one combined circuit-breaker cannot be expected to tolerate total interruption of supply because an earth-fault leakage has occurred in, say, an electric iron. . . . This consideration has already led to the use of voltage-type circuit-breakers often being restricted to power circuits, such as that for cookers." In the subsequent discussion speakers were almost unanimous in recommending that lighting circuits should not be controlled by leakage trips in small domestic premises; if earthing conditions were difficult then the lighting should be made in an all-insulated system leaving other circuits to be installed in steel conduits if required.

How then would the writer recommend that the alternative earthing arrangements be advocated? It is noted from one maker's list that two 30 A leakage trips are cheaper than one 60 A trip (£4 6s for two 30 A against £5 6s for one 60 A) so the obvious application is one trip for the cooker and one for the ring circuit; the difference in cost will pay for the fixing of the second trip. In addition, some discrimination in protection will be achieved, and the consumer will never be left completely in the dark, at what might possibly be an inconvenient or even dangerous time. It is thought that the continued use of the leakage trip as a main switch can only bring a useful method of protection into eventual disrepute, and the writer is certain that this is far from being the intention or desire of the able compilers of the specifications.

Further sub-division of leakage protection is now possible, with the recent appearance of a combined 15 A trip and 13 A socket-outlet, particularly applicable to domestic premises. There is always a risk that if the leakage trip is placed at the main intake position the test key will not get pressed with the frequency necessary to ensure operation under fault; with local trips in full view that test may become almost automatic on the user's part.

No doubt the compilers of the specifications had the best of reasons for their decisions, and perhaps we may hear something of them. It is thought, however, that certain alternatives to the materials and methods advocated should be permitted, without such rigid adherence to installation practices that many would consider obsolescent.

Engineering Exhibition at Olympia

REVIEW OF ELECTRICAL AND ALLIED EQUIPMENT

THIS year the Foundry Trades Exhibition is being held in conjunction with the Engineering, Marine and Welding Exhibition, a slight change from 1953 when a Chemical Plant Exhibition was incorporated. Open from the 1st to the 15th September and with more than 500 exhibitors this exhibition is as popular as ever in the general engineering world. Every hall at Olympia is occupied and the area covered is more than ¼ million square feet. Most of the well-known electrical manufacturers are represented by comprehensive displays and in addition electrical drives, controls, instruments or heating form part of a vast number of the products shown. In order to give our readers some idea of what is to be seen we have roughly segregated the exhibits under various headings and mentioned those things which we feel will be of interest to them.

BOILERS

The John Thompson group are exhibiting a scale model of the boiler plant which they are installing at the new Tilbury generating station of the C.E.A. Six 550,000 lb/hr boilers are involved and an interesting feature of the construction is their suspension by rod slings from overhead, allowing for expansion downwards. The suspended weight of each boiler is 1,040 tons. Also shown are two "packaged" boilers, one of these being the "Minipac" available in sizes from 3,500 lb/hr with pressures up to 250 lb/sq in. These boilers are completely automatic with all auxiliaries built in and both "packaged" boilers are for oil burning. This group of companies is also showing some fabricated samples of the type of work being carried out in various metals for atomic energy projects.

International Combustion, Ltd., display features of current water tube boiler contracts for the C.E.A. one feature being a working scale model of a "Lopulco" pulverizing mill.

Among the products which Babcock & Wilcox, Ltd., are showing for the first time is the "Steambloc" automatic oil-fired boiler manufactured in evaporative capacities from 1,500 to 18,000 lb/hr. This is a completely self-contained unit with automatic control of the oil firing for maximum efficiency, and fitted with a wide range of safety devices. It requires no special boiler house or tall chimney stack since it is a forced-draught unit needing only a rudimentary vent for exhaust gases. Other new exhibits on this stand are the "Selectable Superheat" boiler which enables a wide range of temperature control to be attained with a single furnace design; pneumatically operated soot blowers; and the Babcock shot cleaning system for horizontal tube surfaces.

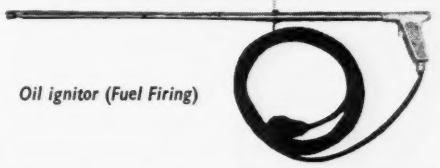
With the relentless advance towards ever higher operating pressures the manufacturers of boiler tubes and drums are faced with never-ending problems. Stewarts & Lloyds, Ltd., make their principal display one of boiler tubes both seamless and electric resistance welded, and manipulated pipework for high pressures and temperatures. Accles & Pollock have among the more normal items examples of seamless tubes in titanium, zirconium and tantalum and such specialities as seamless, stainless, flexible tubing. Tubes, Ltd., also show many boiler items.

Senior Economisers, Ltd., have a fully cased "H" tube economizer on view. Other types being shown are the welded type for the C.E.A., the "Twintube" and the marine economizer, the last being a steel tube welded type with cast iron gills shrunk on to form the heating surface.

Boiler mountings, stop valves, safety valves, etc., can be seen on the stand of Hopkinsons, Ltd., and a new development of theirs, the remote control water level television system which reproduces instantaneously the appearance of remote situated water level indicators on large boilers. This system was described briefly in our description earlier this year of Chadderton power station.

A selection of boiler mountings and piping valves including a sectioned Dewrance consolidated Maxiflow type safety valve are also shown on the stand of Dewrance & Co., Ltd., together with a 30in amplified scale working pressure indicator which shows at a glance the slightest deviation from a working pressure.

With the increasing interest being shown in the oil firing of boilers of all sizes several companies are exhibiting equipment for use in this connection. Fuel Firing, Ltd., show their FFI/80 initiator used for the quick starting of boilers normally fired on pulverized fuel, their portable electric ignitor, and their "Modulator." This is the name given to their first load carrying burner which incorporates a revolutionary design of air control. Rubery Owen & Co., Ltd., show a fully automatic gas-oil burner capable of an output from 60,000 to 320,000 B.Th.U./hr and Mirrlees (Engineers), Ltd., show a new range of pumps for fuel-oil burner duties.



Oil ignitor (Fuel Firing)

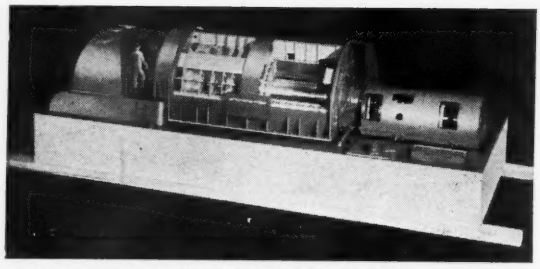
Boiler feed pumps are shown by Tangye's, Ltd., and Copes Regulators, Ltd., have on view their two-element marine type feed water regulator operating from changes in steam flow and water level and especially advantageous during periods of manœuvre. Their line type regulator, high and low water alarms, etc., can also be seen.

Any product which can increase efficiency and reduce maintenance costs is always welcome and among the products of Xzit (G.B.), Ltd., which help towards this end are refractory coatings for bonding, coating and patching refractory bricks, and "SSR," an additive for breaking up most types of sludge, inhibiting further sludge formation in storage tanks and preventing the clogging of fuel lines and filters. Another item is a fire scale and soot eradicator, a non-inflammable, non-explosive powder, designed to act upon and reduce the residual deposits of combustion to allow them to be easily removed by blowing or brushing.

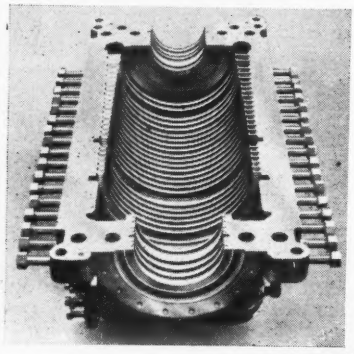
The Clean Air Bill recently introduced by the Minister of Fuel and Power lends special interest to the "Electricon" smoke density equipment shown by Ronald Trist & Co. It consists of a projector, receiver, control unit and a density indicating meter and an alarm can be incorporated to give audible warning of dense smoke.

TURBINES AND COMPRESSORS

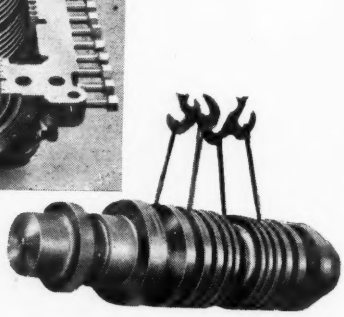
The bottom half of a completely bladed high pressure cylinder for a 60 MW, 3,000 r.p.m. three-cylinder turbo-generator is shown on the stand of C. A. Parsons & Co., Ltd. Intended for steam conditions of 900 lb/sq in and 900 deg F, the blading is arranged on a constant mean diameter which enables the cylinder to be constructed with a perfectly straight parallel flange. An interesting feature is the elimination of the vertical bolts on the horizontal joint and the fundamental change in the design of the flange. The two halves of the cylinder



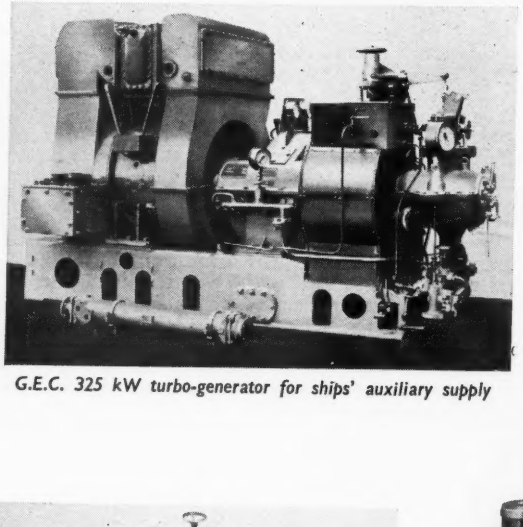
Sectioned model of a 60 MW Metropolitan-Vickers hydrogen-cooled generator



Left : Parsons h.p. turbine cylinder (bottom half)



Right : Firth Brown monobloc rotor forging for 60 MW set



G.E.C. 325 kW turbo-generator for ships' auxiliary supply

are held together by clamps that are applied or taken off by movement in the horizontal direction. Other exhibits are the auxiliary shaft of a 60 MW turbine and speed reduction gearing for the exciter drive on a 60 MW set reducing from 3,000 to 1,000 r.p.m. On the Metropolitan-Vickers stand is a model of a 100,000 kW hydrogen cooled turbo-generator as supplied to the C.E.A. This model is sectioned to show the internal construction. Also shown is a complete high pressure cylinder for a 7,300 s.h.p. marine turbine and a 350 kW marine auxiliary set intended for operation at 450 lb/sq in, 750 deg F and generating at 220 V d.c. Another auxiliary turbo-generator of 325 kW output is shown by the G.E.C.—one of 20 similar sets being supplied for tankers at present under construction and designed to operate at 10,000 r.p.m. Double helical reduction gears are used to obtain a generator speed of 1,100 r.p.m.

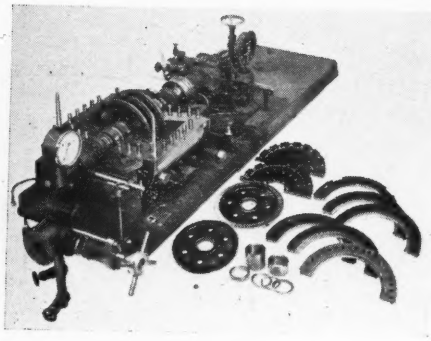
Richardsons, Westgarth, whose 60 MW turbo-alternator at Portobello has for some time headed the efficiency tables, are showing a model of a 30,000 kW set for 22 kV generation, complete with condensing plant and auxiliaries. In the design of these sets they are of course associated with Brown Boveri. Belliss & Morcom, Ltd., have produced a small steam turbine plant specially designed for instructional use in colleges and technical schools. It enables a variety of tests to be carried out to determine the effect of different types and combinations of blading and of changes in speed and steam conditions. One, two, or three Rateau stages may be used with two kinds of nozzle, either fractional or complete circumferential arcs. Alternatively it can be arranged with two or three Curtis rows or combinations of Curtis and Rateau. The installation includes the condensation plant with auxiliaries and the load is absorbed by a Heenan & Froude direct coupled water brake.

The dominating exhibit on the stand of the Firth Brown companies is a 60 MW monobloc rotor in high tensile alloy steel. This forging is 17ft long and over 28 tons in weight. The Yorkshire Copper Works, Ltd., show typical examples of the corrosion of non-ferrous condenser tubes and contrast them with two lengths of aluminium-brass tube of their manufacture which have been in service for 24 years and are still in perfect condition. Samples from their complete range of condenser and refrigeration tubes are shown.

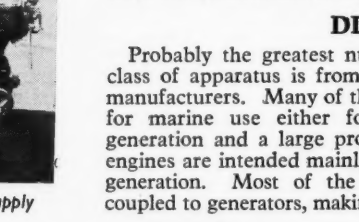
Rotary compressors are exhibited by the B. A. Holland Engineering Co. and a compressor with a cut away casing to show the construction is displayed by James Howden & Co.

DIESELS

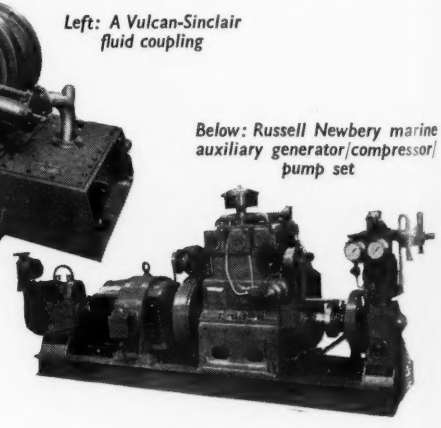
Probably the greatest number of exhibitors of any one class of apparatus is from the ranks of the diesel engine manufacturers. Many of those engines shown are intended for marine use either for propulsion or for auxiliary generation and a large proportion of the land type diesel engines are intended mainly as prime movers for electricity generation. Most of the exhibitors show their engines coupled to generators, making up a complete unit.



Left: Belliss & Morcom steam turbine for educational use



Left: A Vulcan-Sinclair fluid coupling

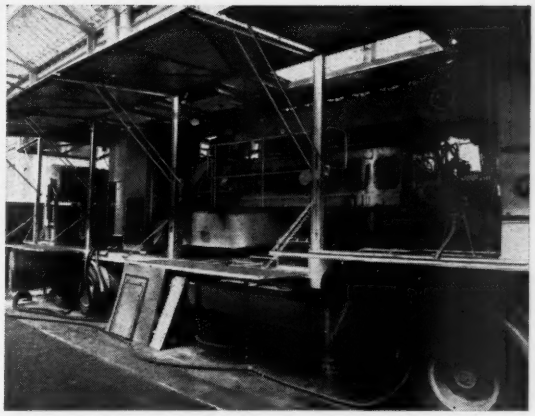


Below: Russell Newbery marine auxiliary generator/compressor/pump set

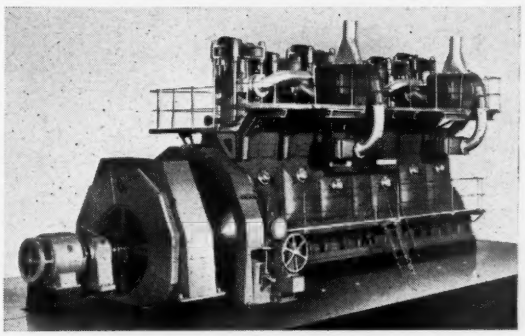
Among such are A.E.C., Ltd., who have on show a 55 kVA and a 90 kVA diesel-alternator set using A.E.C./Spicer twin flexible couplings and supplied complete with radiators, silencers and engine instrument panel. W. H. Allen, Sons & Co. have a 150 kW pressure charged alternator set consisting of a four cylinder 600 r.p.m., 270 b.h.p. engine direct coupled to an Allen alternator. Associated British Engineering, Ltd., which is the parent company of six well-known concerns, has a number of transportable power sources on exhibition: one of these is a 100 h.p. unit by Henry Meadows, Ltd. A range of small complete generating sets from 1 to 9 kW is offered by the Coventry Victor Motor Co., Ltd., and Crossley Bros. show large two-cycle power units for diesel-electric locomotives. The larger of these is an eight cylinder "V" type developing 1,380 h.p. at 650 r.p.m. The whole power unit is carried on a three point rubber suspension, the generator being flange mounted on the engine. A total of 94 of these units is being supplied on one order for diesel-electric locomotives by the Irish State Transport System. A totally enclosed self-contained ready-to-operate power pack complete with radiator, clutch, fuel tank, etc., is demonstrated by W. H. Dorman & Co., Ltd. This can be used as a power unit for generator sets. Among the English Electric Company's many exhibits are a 400 kW mobile emergency diesel generating station on wheels, and a 16-cylinder "V" form diesel engine from their S.V. series used in many industrial traction and marine duties. The units on view are super-charged by Napier exhaust turbo-pressure chargers. Small marine generating sets producing 14 kW and a self-contained six cylinder 60 kW set, working during the exhibition, are exhibited by Fodens, Ltd.; and small 4½ and 10 kW marine auxiliary sets are also shown by Lister-Blackstone.

A wide range of diesel engines and other engineering and electrical products is shown on the two stands occupied by Harland & Wolff, Ltd. Among these is an 8-cylinder four-cycle turbo-supercharged diesel engine coupled to a H & W alternator developing 625 kVA. This set is typical of a range intended for land or marine purposes.

In the post-war years more than 700 McLaren 55 kW generator sets have been put into service and the model can truly claim to be well tested. It consists of the McLaren M4 diesel engine developing 88 b.h.p. at 1,000 r.p.m. coupled to a Brush alternator. Typical of the range of oil engines manufactured by Rolls Royce, Ltd., is a fully sectioned 6-cylinder supercharged example shown on their stand. Engines from this range have been used by several makers of small generating sets and a feature of the range of engines is a common bore and stroke for the entire range of four, six and eight cylinder types, right- or left-hand build according to requirements and a wide choice of auxiliary mountings and drives. Marine auxiliary sets are again shown by Russell Newbery, the largest on view being a 30 kW model running at 1,000 r.p.m. and arranged for compressed air starting and fresh water

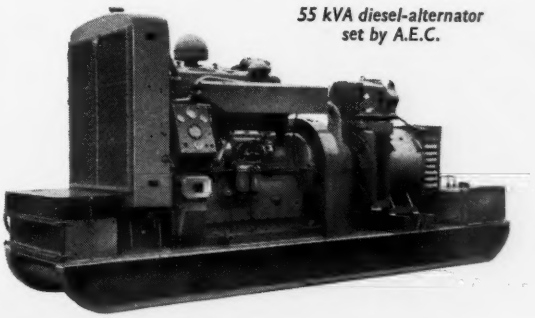


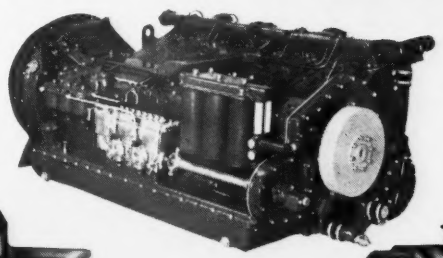
English Electric 400 kW mobile diesel generating plant



Scale model of 3,200 kVA set by Harland & Wolff

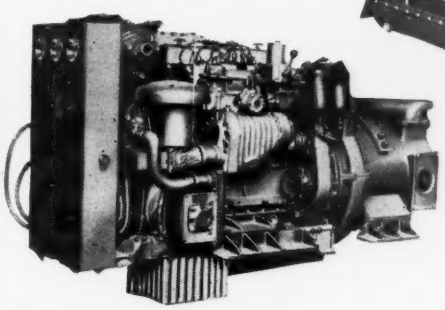
55 kVA diesel-alternator set by A.E.C.



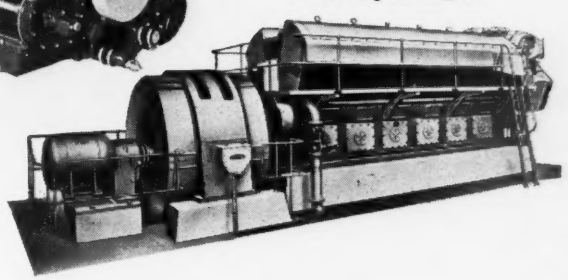


Left: Rolls Royce 8-cylinder horizontal supercharged engine for a rail car

Fodens 40 kW marine generator

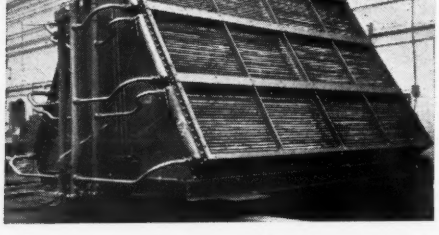


Mirrlees, Bickerton & Day 3,240 h.p. industrial generating set



cooling. A versatile unit on show is a 13 kW model using a 27 h.p. engine which through a clutch on one side drives a general service pump with a capacity of 30 tons/hr and on the other side is clutch coupled to a 13 cu ft/min air compressor. Ruston & Hornsby, Ltd., and Davey Paxman & Co., Ltd., have a joint stand displaying many items from their range, including the type YHG engine which is of light alloy construction designed to run on natural gas and particularly suitable for oil well drilling duties. The engine is rated at 500 h.p. at 1,250 r.p.m.

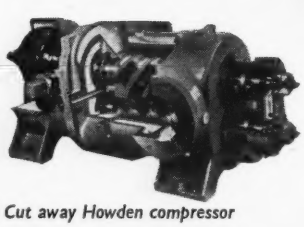
Several manufacturers of apparatus for use in conjunction with diesel engines are exhibiting, among them Serck Radiators, Ltd., who show heat exchangers, oil coolers and radiators; Henry Wiggin & Co., Ltd., who include diesel engine turbo-blowers, exhaust valves, pre-combustion chambers, etc., on their stand; and C.A.V., Ltd., who have a representative range of fuel injection equipment for diesels and electrical equipment for charging, starting, etc., on display. Shell Mex & B.P. have a large stand and take as one of their themes, efficiency in the use of oil fuel. A special unit on show has been built to demonstrate the effects of incorrect combustion and poor fuel atomization. A medium pressure air atomizing burner of standard commercial pattern mounted in a forced draught casing is used for the purpose. An exhibit in the section devoted to lubricants is a model two-cylinder diesel engine demonstrating the prevention of corrosion of cylinder liners. One liner is treated with a straight mineral oil and the other with a special additive-type oil designed for the lubrication of certain highly rated diesel engines. The liners are subjected to a mist of dilute sulphuric acid and the ability of the additive type oil to inhibit corrosion is demonstrated.



Above: Diesel engine heat exchanger by Serck

Two-stage 10 h.p. Worthington Simpson air compressor

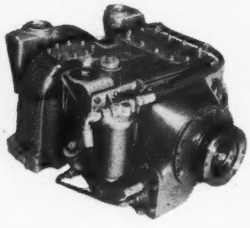
Hydraulic variable speed drive by Churchill-Sturm

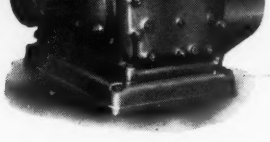


Cut away Howden compressor

Megator DK4 pump and marine motor

R14 gear box for rail cars by Self-Changing Gears, Ltd.





GEARS AND PUMPS

Several gear manufacturers are exhibiting their products at Olympia, among them Carter Gears, Ltd., who devote their stand entirely to a display of hydraulic infinitely variable speed gears. On view for the first time is their type "F" size 14 rated at 3 h.p.

Churchill-Sturm, Ltd., also show variable speed hydraulic drives, these consisting of an oil pump driven by a constant speed electric motor and driving an oil motor connected to the output shaft. Both pump and motor are enclosed in a common casing which serves as a reservoir for the oil. The sizes available range from 1¼ to 32 h.p.

Gears, turbine gear units and rail car gear boxes are among the items represented on the David Brown stand. A selection of worm reduction gears of the single and double reduction type ranging from 1/20 h.p. to 20 h.p. is displayed on the stand of S. E. Opperman, Ltd., while Opperman Gears, Ltd., show a number of geared motors and worm speed reduction units ranging up to 120 h.p. Large numbers of the R14 rail car gear box shown by Self-Changing Gears, Ltd., are being supplied to British Railways for their new lightweight diesel rail cars: the principal features are the compound epicyclic four-speed gearing, the pressure lubrication by a gear type pump and the external paper-element oil filter. A diesel locomotive reverse and reduction gear box is shown in "exploded" form enabling the gearing to be examined in detail.

Allspeeds, Ltd., are showing their variators which can be supplied fitted with motors to give any speed range from 5 to 765 r.p.m. with electrical or mechanical remote speed control. The type 5F variator has been designed for use with very small f.h.p. motors and can transmit 1/33 h.p. at all speeds. Using an input speed of 1,500 r.p.m. it will provide infinite speed variation from 4,500 r.p.m. maximum down to 500 r.p.m. minimum.

Pumps of all types, sizes and functions are shown on a great many stands. Hayward Tyler & Co., Ltd., display a wet stator type bore-hole pumping unit with a capacity of up to 1,900 gal/min against a maximum head of 1,250ft. Gilbert, Gilkes & Gordon, Ltd., have two stands in the exhibition both devoted to marine type pumps, and Keelavite Rotary Pumps & Motors, Ltd., have examples from their range of pump/motor units for duties from fractional h.p. up to 300 h.p.

Megator Pumps & Compressors, Ltd., show their two new ranges of pumps, the "K" and "R." The latter is in stainless steel and bronze with capacities from 5 to 16 gal/min. Both types employ the now familiar Megator sliding shoe principle. Mono Pumps, Ltd., show units suitable for use as cooling water circulation pumps as part of a display which is principally devoted to marine equipment.

Worthington Simpson, Ltd., exhibit a wide range of self-priming and non-self-priming centrifugal pumps of their patented "monobloc" construction in which the pumps and motors are combined to form single, compact, balanced units in sizes ranging from ½ to 30 h.p., with capacities up to 1,200 g.p.m. and heads up to 600ft, depending on capacity.

SWITCHGEAR

Most of the leading switchgear manufacturers are represented at Olympia, in many cases the equipment they are showing being that developed for use on board ship where certain differences from normal industrial switchgear are usual.

The British Thomson-Houston Co. show a multi-motor control board ordered by Vickers Armstrongs for a ship

at present under construction. The starter units are of the withdrawable plug-in type allowing maintenance to be carried out with the minimum of inconvenience, and individual starters can be removed and replaced or interchanged with an identical unit. The type RB automatic circuit recloser for use on power lines is again shown. The G.E.C. have air break cubicle switchgear for ships, construction of the cubicles being such that no supporting framework is necessary and the unit parts are so designed that cubicles up to 6ft 6in high can be assembled in standard widths from 1ft 6in to 3ft 6in and may be installed individually or joined together to form one switchboard.

Brookhirst Switchgear, Ltd., who are well known for their marine control gear, have a wide selection of both the a.c. and d.c. types on view and industrial motor control is represented by comprehensive displays of basic components. A range from a high-voltage circuit-breaker unit down to limit switches and emergency push switches is shown on the stand of George Ellison, Ltd. Included is the recently introduced "Ellison" 20 A oil break circuit-breaker for direct-to-line starting and for feeder circuits. The breaker is A.S.T.A. tested and is suitable for voltages up to 660. It incorporates a built-in isolator available with h.r.c. fuses and auxiliary switches. In the Erskine, Heap range on exhibition is switchgear up to 11,000 V at 250 MVA, low-voltage switchgear and motor control gear of all types and among the industrial and marine motor control equipment shown on the Allen West stand is a grouped contactor starter switchboard for the new Cunard liner *Carinthia*.

A German firm exhibiting is the Klockner-Moeller Co. An interesting exhibit on their stand is a heavy duty distribution board for a maximum busbar load of 1,000 A and for a maximum voltage of 600. It is designed as a main distribution board for an industrial plant and in very dusty surroundings or a polluted atmosphere it can have a compressed air plant added to maintain a slight internal pressure. Transparent covers which are strong and flame resistant facilitate constant supervision.

Among the equipment shown on Reyrolle's stand is the first production model of their new type JKSS outdoor combined ring-main switch and tee-off fuse switch unit. This has two oil-immersed switches capable of breaking their rated full load current of 400 A, and able to make circuit on to faults of up to 250 MVA at 11 kV.

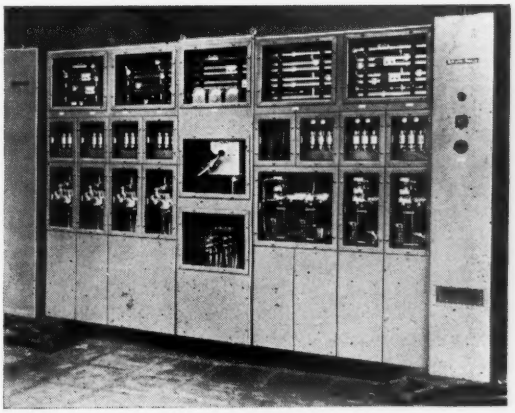
Among the smaller items Clang, Ltd., demonstrate a range of waterproof plugs and sockets ranging up to 50 A and Burgess Products Co., Ltd., show applications of their well-known micro-switches.

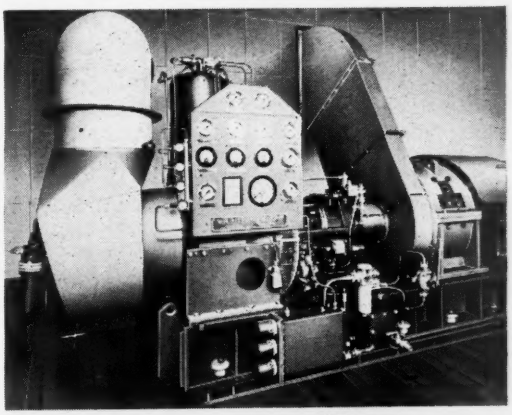
GAS TURBINES

Evidence of the increasing interest being shown by many users in the possibilities of gas turbine drives is given by the number of companies who have this class of prime mover on show.

On the B.T.H. Company's stand is a model of a 5,500 h.p. gas turbine for the Shell tanker *Auris*. This is to replace the B.T.H. gas turbo-alternator set and the three diesel driven alternators now installed. W. H. Allen have a 350 kW gas turbo-generator for marine stand-by and emergency duty prominently displayed. This unit is a single-shaft open-cycle type engine consisting of three main components—a single stage centrifugal compressor, a reverse flow com-

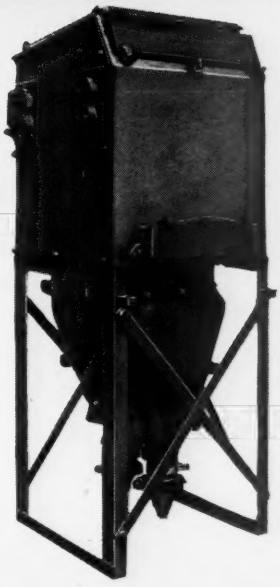
Heavy duty switchboard by Klockner Moeller





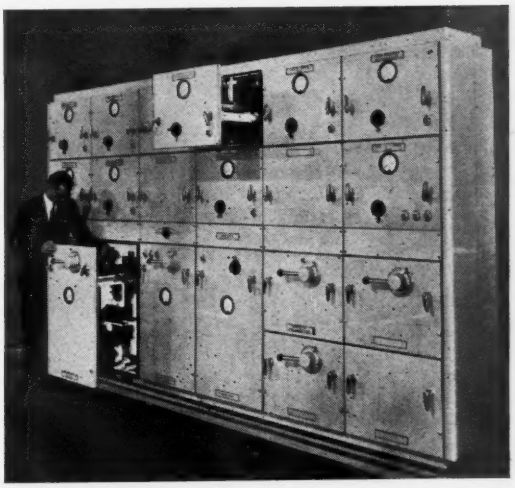
Above: W. H. Allen 350 kW gas turbine generator for marine use

Clang weatherproof plug



Reyrolle combined ring-main switch and tee-off fuse-switch outdoor unit

B.T.H. multi-motor marine control panel



bustion chamber and a two stage axial flow turbine. The turbine drives its own compressor at 15,000 r.p.m. and a d.c. generator through epicyclic reduction gearing at a speed of 1,500 r.p.m. Ruston & Hornsby show their standard "TA" gas turbine which has a maximum rating of 1,410 h.p. and this has the covers removed to allow internal examination. Features of special interest are the air cooling system for the turbines and the fully kinematic type construction employed which facilitates rapid starting and stopping of the machine by ensuring that all hot parts are free to expand and contract as the gas temperature changes.

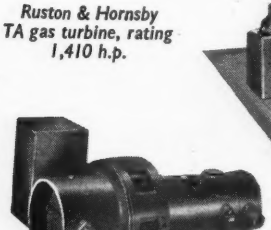
FANS, ETC.

Among the exhibitors of fan equipment are Keith Blackman, Ltd., who have on view three examples from their range of "Tornado" p.v.c. fume-removal fans. These are made from a rigid p.v.c. material resistant to fumes from various chemicals at temperatures up to 120 deg F. Standard & Pochin Bros., Ltd., include among their exhibits high-pressure fans of the type used on conveying plants, both for applications such as pulverizing when the material actually passes through the fan, and grain drying where the material does not pass through it.

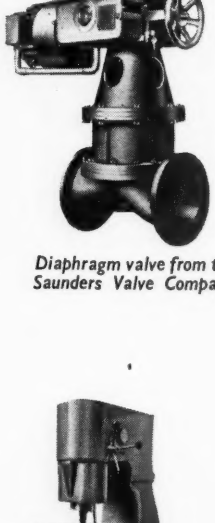
An application of centrifugal fans is to blow air through a specially constructed heating chamber and direct it by means of a nozzle in order to raise the temperature of a particular item. This type of equipment is shown by Service Electric Co., Ltd., under the name of "Secomak." New Welbeck, Ltd., have their range of industrial vacuum cleaners on show including a new model, the "Bak-Vac," which is a lightweight portable cleaner carried on the operator's back and equipped with finger-tip control by means of a two-pole switch. For use in controlled ventilation schemes and for industrial operations requiring maximum cleanliness the "Electro-Maze" electric air filter made by Air-Maze, Ltd., is a useful item. Supplied with 10,000 V d.c. it is designed to remove 90 per cent or more of all air-borne dust, soot, etc., down to $\frac{1}{10}$ micron in size, or less.

Air Control Installations, Ltd., exhibit a dynamic precipitator for dry collection of most types of granular industrial process dust and a hydrostatic precipitator in which the cleaning action is obtained with an inverted "S" shaped water curtain. Both of these units are shown in operation.

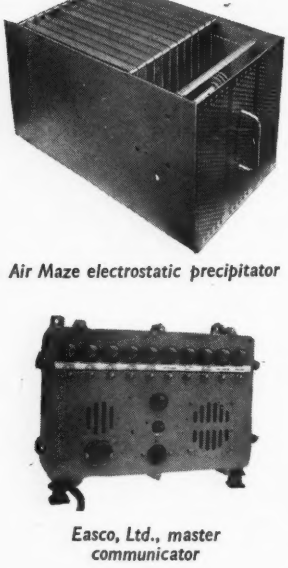
Ruston & Hornsby TA gas turbine, rating 1,410 h.p.



Secomak electric siren

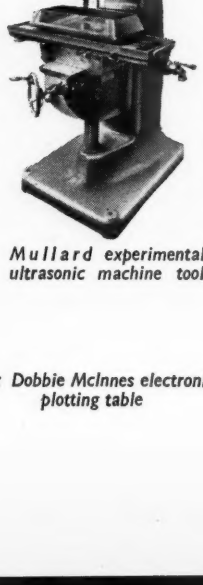


Diaphragm valve from the Saunders Valve Company

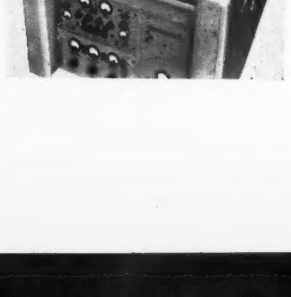


Air Maze electrostatic precipitator

Easco, Ltd., master communicator



Mullard experimental ultrasonic machine tool



Left: Dobbie McInnes electronic plotting table

INSTRUMENTS AND CONTROL

In almost every trade and industrial exhibition held to-day electrical indicating, recording or control apparatus of either the conventional or the electronic type is prominently displayed. At the Engineering and Marine Exhibition this class of equipment naturally forms a considerable proportion of the whole and life on board ship would seem to be getting increasingly complicated from the electrical point of view.

A completely new range of pressure gauges and dial thermometers which can be fitted with electrical alarm contacts is shown by the Accurate Recording Instrument Co., Ltd. Bayham, Ltd., well known for their flow indicators, etc., are exhibiting a versatile electrically operated remote reading contents gauge which can be supplied with selector gear so that several similar tanks may be indicated on a single dial. The tank unit consists of a float arm which rotates the electrical transmitting mechanism through magnetic couplings thereby eliminating the possibility of liquid leakage into the electrical element. Solenoid operated valves and pressure switches for a wide variety of applications can be seen on the stand of Black Automatic Controls, Ltd., and on that of the British Rototherm Co. there are numerous examples of thermometers, dial temperature recorders, etc.

Chadburns, Ltd., who deal principally with ships' telegraph apparatus, have been developing remote bridge controls for the direct control of main diesel engines or controllable pitch propellers in tugs, ferry boats and trawlers. A fairly recent development is the Chadburn isolator/selector system by which any number of transmitters can be electrically interconnected without the necessity of mechanical connections or the use of change-over switches. There is a working example of this system on their stand.

Cathodic Corrosion Control, Ltd., on their stand demonstrate on a laboratory scale applications of both sacrificial anode and power impressed systems of cathodic protection to such structures as ships' hulls, tanker compartments, submarine pipelines, etc. The complex measurements demanded in the correct design and application of cathodic protection call for a highly specialized form of instrumentation and the range developed by this company is available for inspection and demonstration.

Dobby McInnes, Ltd., show their latest type of "Farnboro" electric indicator using a diaphragm type of pick-up and electronic relay unit and another interesting instrument is a medium speed plotting table measuring 30in by 30in and able to plot the path of a target against that of an interceptor. Easco Electrical Co., Ltd., put the emphasis on marine loud hailers and talk-back systems, with associated microphones and loudspeakers, together with a demonstration of water activated life jacket lights and similar units suitable for rafts or buoys. An addition

to the well-known equipment for the remote indication of levels, pressures, etc., shown by Evershed & Vignoles, Ltd., is their "Syntorque" rudder indicator employing a transmitter and receiver.

Pressure switches covering ranges from 0·1in of water to 6,000 lb/sq in, including Buxton certified flameproof types, are among a range of instruments for marine and industrial applications shown by K.D.G. Instruments, Ltd.; and the Saunders Valve Co., Ltd., give prominence to a newly introduced electrically operated valve typical of their range from 6 to 12in. Radio Heaters, Ltd., are displaying two new induction heating equipments in their "Radyne" range. One of these is a bench type occupying an area only 2ft 7in by 1ft 10in and ideal for small soldering and brazing work. It is housed in a robust cast aluminium case. The other new equipment is a completely self-contained 25 kW unit.

Among the exhibits on the Redifon stand is a useful new 10-20 channel v.h.f. radio telephone which can be converted from a.m. to f.m. by means of a switch. Six models are available and are designed to meet the needs of port and harbour services, tug and fishing fleet owners, etc., for a rapid, private, and economical means of shore to ship and ship to shore communications. Smiths Industrial Instruments, Ltd., have a wide selection of measuring and indicating instruments on view including an extension to their range of electric tachometers. A direct mounting angle type 12in magnetic tachometer which can incorporate a seven figure counter if required, and specially designed for marine use, is also on show.

Southern Instruments, Ltd., show recording cameras, electronic engine indicator equipment, and a range of transducers for measuring pressure, force, vibration, movement and acceleration. An industrial betatron for 15 MeV with very high penetration suitable for examining massive castings, etc., is shown by Sierex, Ltd. The machine together with a cooling pump is mounted on a trolley and is mobile to a remarkable degree for such a high power equipment. In addition, ultrasonic impulse apparatus is shown for detecting flaws in materials without resorting to X-rays.

Solus Schall, Ltd., have available apparatus to measure such things as the thickness of non-conducting layers on a non-ferrous base, for measuring the thickness of non-ferro-magnetic layers on a ferro-magnetic base, for the rapid and accurate thickness measurement of ferrous sheet and strip, etc. Teddington Industrial Equipment, Ltd., show their well-known range of automatic control equipment for refrigeration, heating, air conditioning, etc. A special feature is the new range of protection and control equipment for all types of automatic oil burners.

Portable industrial X-ray equipment is also shown by Marconi Instruments, Ltd.; a rotary mobile unit is the type TF1512, primarily suitable for the examination of plastics, fibrous materials, aluminium, magnesium and other alloys; it has a maximum rating of 85 kV peak. An interesting new apparatus on the Mullard stand is a 2 kW ultrasonic machine tool. In this a high frequency reciprocating motion is imparted to the tool, enabling results similar to those obtained by normal drilling, milling and lapping to be achieved with a high degree of precision on hard and brittle substances. The actual cutting is performed by abrasive particles fed to the tool tip. A standard ultrasonic generator and a specially designed transducer are employed. Precision machine tool operators can use the tool after a few hours' training. Decca Radar show a new marine radar, the Decca 212. This was introduced in February and is designed primarily for smaller ships, more than 400 of which have already placed orders. Also on display is their long range high performance radar, the Decca 45. Both these types are shown fully working with the radar scanner fitted on the roof of Olympia.

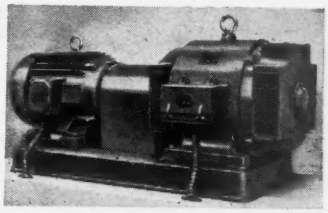
MOTORS

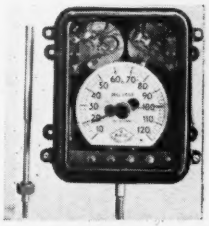
Electric motor manufacturers are well represented at the exhibition and among the items shown the Electric Construction Co., Ltd., are demonstrating a motor-alternator set consisting of a self-regulating, self-exciting alternator driven by a squirrel-cage motor of the new BSD specification 2083. The Electro-Dynamic Construction Co., Ltd., amongst a varied display have lightweight battery electric traction motors and portable petrol driven generating sets.

The Harland Engineering Co., Ltd., are showing electrically driven centrifugal pumps all of their own manufacture, including sewage pumps, submersible sets, etc.; hydro-electric plant is illustrated by sectional drawings. Houchin, Ltd., show salient pole type alternators and frequency convertors. An interesting exhibit on the stand of the Lancashire Dynamo Group is the partly wound stator of a 833/445 h.p., 738/588 r.p.m. 3·3 kV boilerhouse fan motor enabling the winding details and the construction to be studied; examples from a new range of dust-tight and hose-proof machines, specially developed for the chemical industry and for explosive filling factories, are also shown.

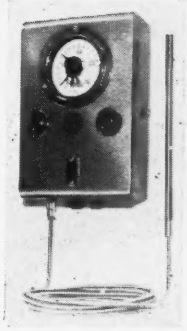
Mawdsleys, Ltd., have a 120 kVA marine motor-alternator set intended for fluorescent lighting, lift motors, etc.; and Laurence, Scott & Electromotors, Ltd., among several features shown in operation, have the "Speedmaster," a single unit convertor for the supply of variable frequency,

Right: Motor-alternator set by Electric Construction Co.

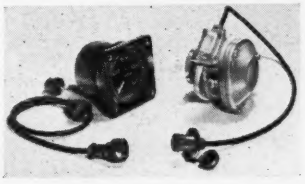




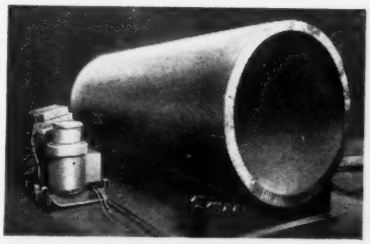
Temperature indicator-controller by A.R.I.C.



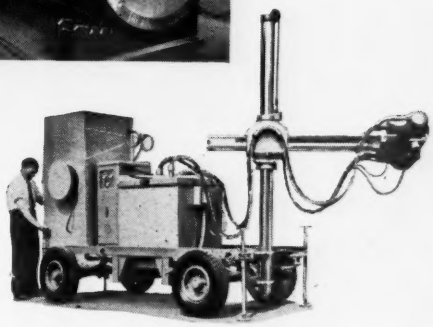
Temperature recorder from K.D.G. Instruments



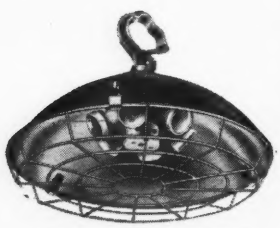
Tachometer generator by Smiths Industrial Instruments



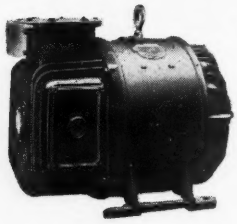
Left: The 15 MeV betatron of Sierex, Ltd., on a typical job



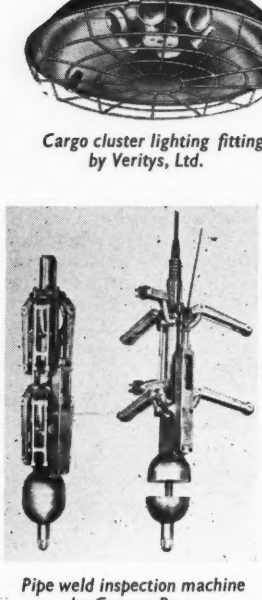
Right: Marconi 250 kV industrial X-ray unit mounted on a trailer



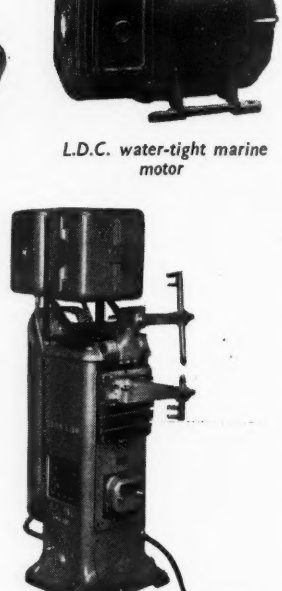
Cargo cluster lighting fitting by Veritys, Ltd.



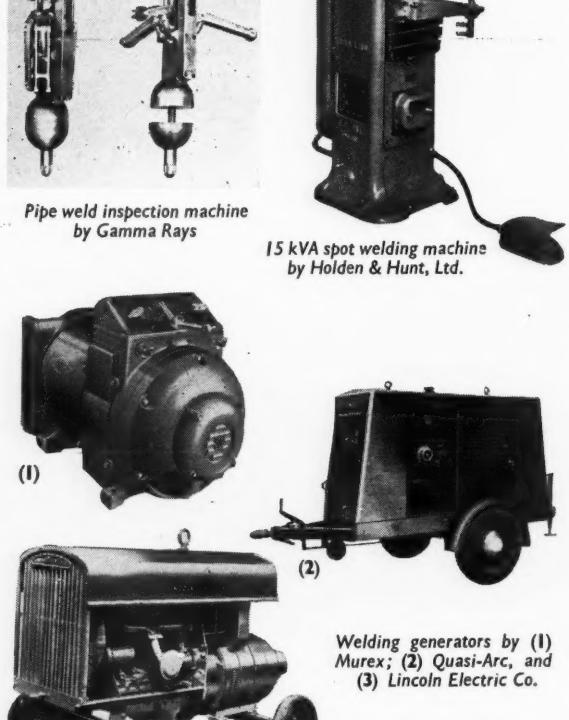
L.D.C. water-tight marine motor



Pipe weld inspection machine by Gamma Rays



15 kVA spot welding machine by Holden & Hunt, Ltd.



Welding generators by (1) *Murex;* (2) *Quasi-Arc, and* (3) *Lincoln Electric Co.*

used mainly for the operation and control of variable speed squirrel-cage motors. The unit has a high output for its physical size and a high efficiency and as demonstrated consists of eight squirrel-cage motors of differing sizes, fitted with flywheels to provide a kinetic load and with tachometer indicators. When supplied from the "Speedmaster" they demonstrate stepless simultaneous speed variation, effective load sharing, smooth starting and reversing, etc.

A new gasworks type motor is a feature of the Newman Industries' stand. This is fully protected for operation in dusty, dirty or wet atmospheres and is offered in the full range from ½ to 25 h.p. Tuscan Engineering, Ltd., have on view a very recently developed range of self-exciting, self-regulating alternators. These are of the rotating armature type and are inherently self-regulating within $\pm 2\frac{1}{2}$ per cent of rated voltage under normal operating conditions at unity power factor. Super-silent marine type motors are among the many types of marine motors and control gear shown by Veritys, Ltd., who also exhibit several lighting fittings for use when cargo is being loaded or unloaded.

Closely allied to the manufacture of motors is the question of suitable insulation and several makers of insulation have stands at Olympia. Among them is Tufnol, Ltd., who show among specimens of sheets, tubes and rods, an interesting series of components moulded to specification.

WELDING EXHIBITION

There are about 35 exhibitors in the welding section many of them displaying electric welding machines. Among these Metropolitan-Vickers have on show an automatic arc welding equipment operating as a submerged unit but designed so that with only slight modification it can be used either submerged or in the open. They also have a display of standard machines for resistance welding. The Quasi-Arc Company are demonstrating their shielded-inert-gas metal-arc (Sigma) welding process—this is a new method of joining metals by means of an electric arc shielded by inert gas and using a consumable electrode in the form of a bare wire. They also demonstrate their SWM/2 semi-automatic process which is suitable for welding aluminium and its alloys and copper and its alloys; Quasi-Arc welding transformers and sets are also shown.

The Lincoln Electric Co. show their "Shield-Arc" welder and their 300 A trailer diesel welder. The English Electric Co. display a range of portable and multi-operator a.c. welding equipment: the portable units include the new LWC200 design which has proved very popular. Asea Electric put the emphasis on film shows, photographs and weld samples to explain modern welding technique and methods. Operators' accessories of all types are included among a wide range of arc welding electrodes by G. D. Peters & Co., Ltd.

The central feature of Murex Welding Processes' stand is an exhibit to demonstrate a basic point in the metallurgy of steel, i.e., the transformation of its atomic structure, associated with temperatures of 900 deg C. Another exhibit is a miniature machine for testing the toughness of steel. The theme of exhibits such as this is a demonstration of how the company's research department aids industry but a range of their products in the way of Murex welding electrodes and generators is also prominent. Sciaky Electric Welding Machines, Ltd., are showing a range of resistance welding machines for spot, seam, projection and portable spot welding, the largest of which is the type PAD100 projection welder nominally rated at 100 kVA. Samples are on view illustrating the various resistance welding processes as applied to the different branches of engineering. Resistance welding machines are also shown by Siemens-Schuckert (Great Britain), Ltd., and spot welding machines by Holden & Hunt, Ltd.

A new diesel engine welding equipment shown by Rockweld is the "Emmac" diesel welder which is claimed as a highly economic unit for site welding. The average fuel consumption has proved to be less than five gallons for a working day of 10-12 hours when using the equipment on a high duty cycle site welding contract. The generator is rated at 250 A continuous arc welding current. Fusarc, Ltd., display ancillary equipment such as turntables and jigs for continuous automatic welding, an important exhibit being a new 10 cwt electronically controlled tilting turntable, this being one of a series of standard machines ranging in capacity up to 6 tons. Also shown is a completely new 1,200 A rectifier for d.c. welding which is much cheaper than a comparable power generator of similar capacity.

Crompton-Parkinson, Ltd., are giving a continuous demonstration of their well-known stud-welding equipment. The exhibits include examples from a wide range of ferrules and studs developed for such applications as the fixing of electrical components to the copper interiors of domestic appliances and the attachment of insulation, etc., to ships' steel bulkheads and aluminium superstructures. Lightweight spot welding machinery suitable for small workshops, garages, etc., can be seen on the stand of the Aro Machine Co., Ltd.

Specialist equipment is being developed all the time to facilitate the examination of welds when completed. Gamma Rays, Ltd., who are pioneers of industrial radiography, show a considerable range of equipment making use of radioactive isotopes. The central feature of their stand is the first industrial unit produced for use with powerful cobalt sources up to a strength of 20 curies and cæsium sources up to a strength of 2,000 curies which will be competitive with the higher voltage X-ray machines both in exposure times and cost. Another new unit on show is a pipeline spider which we illustrate, and which traverses the bore of a pipe and examines the complete circumferential weld from the inside and in one exposure. It can be operated by remote control from the outside of the pipe.

Aluminium is being used more and more for structural use. An interesting exhibit is that of the British Aluminium Company who show the Argon shield welding processes which enable the family of aluminium alloys containing 2-5 per cent magnesium to be welded with ease permitting full use to be made of their tough corrosion resisting properties. T.I. Aluminium, Ltd., are also demonstrating typical joints completed by the Argon arc welding process.

FURNACES

A display by the British Electrical Development Association is devoted to the theme "Electro-heat serves the shipbuilding industry." One section of the stand stresses that for greater productivity electric heat should be used when high temperatures are involved; the value of the product is high in relation to heating costs; accuracy of control is necessary, etc. A second section indicates that electric heating can reduce production costs because output is increased, maximum use is made of factory space and heat is instantly available.

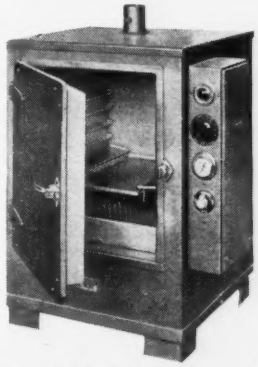
Among the equipment making use of electricity for heating are some of the furnaces on the stand of Barlow Whitney, Ltd. One of these is a vertical loading electric oven suitable for such processes as baking, curing, preheating, and stoving, and also shown are electric high temperature furnaces equipped with silicon carbide resistors. These are of the bench variety, have sliding doors and carborundum floor plates and will operate at temperatures up to 1,400 deg C. Sintering & Brazing Furnaces, Ltd., also have industrial electric heat treatment furnaces on view. One of these of special interest to manufacturers dealing with the sintering of metal powders, copper processing, bright annealing, etc., is suitable for temperatures of 1,150 deg C and a special feature is the very low hydrogen consumption. Electrically heated ovens and melting pots with capacities up to 15 cwt are shown by the Hoyt Metal Company; and Birlec, Ltd., cover three main branches of their production in the exhibition: heat treatment equipment, melting furnaces and Birlec "Lectrodriers" for the humidity control of compressed air, process gases, etc. There is also the Birlec HRP, a new heat treatment furnace for foundry and similar heavy work available in two standard sizes: the larger has a 70 kW rating and internal dimensions of 5ft by 3ft by 1ft 6in.

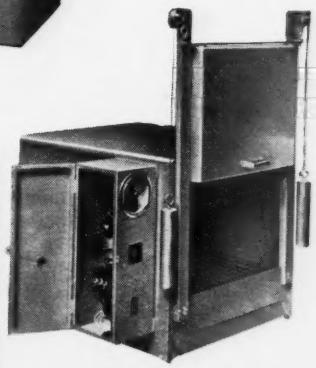
MISCELLANEOUS

Many exhibitors whose products will be of interest to our readers cannot be fitted into the rough classifications we have so far adopted. One of these is the firm of W. & T. Avery, Ltd., who have produced a new range of testing machines for industrial use including an impact testing machine designed to carry out both Izod and Charpy tests. Until now separate testing machines have been necessary. Their latest development in tube-bending machines is shown by Major, Robinson & Co., Ltd.: this enables light gauge non-ferrous tube up to 2in outside diameter to be bent quickly and easily using a small hydraulic pump, although light gauge tubing up to 1¼in can be bent by hand. Pilot Works, Ltd., exhibit an improved hydraulic 15-ton press which gives a high performance from a compact and low-weight design.

Sciaky welding machine

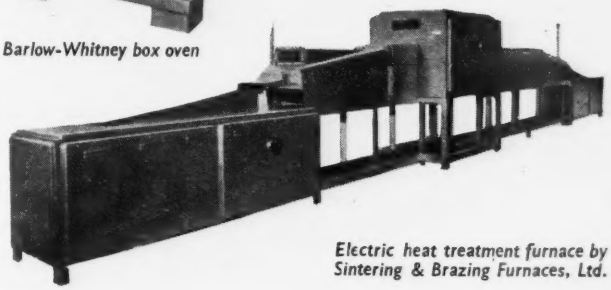
Argonarc pencil torch by the British Oxygen Co.



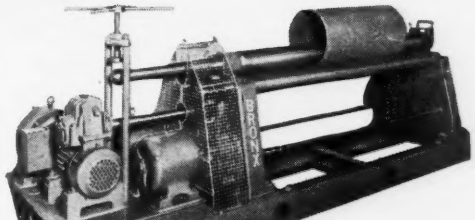


Electrically heated furnace by the Hoyt Metal Co.

Barlow-Whitney box oven



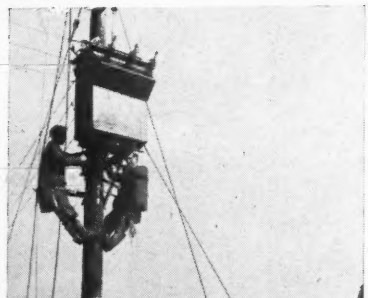
Electric heat treatment furnace by Sintering & Brazing Furnaces, Ltd.



3-roll plate bending machine (Bronx Engineering Co.)

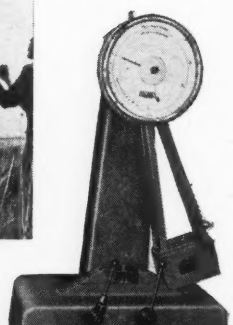
Distribution engineers are always interested in any item which speeds up overhead line construction and Tirfor, Ltd., are demonstrating their pulling and lifting machine which is a portable device operating on any desired length of wire rope and imparting a 13-cwt pull used to drag equipment of a heavy nature. When used in conjunction with a snatch block it is ideal for erecting pole transformers and for lifting and lowering into position in confined spaces such things as electric motors and switchgear.

Clarke, Chapman & Co., Ltd., show new ships' deck acces-



Left: Tirfor pulling and lifting machine in use

Below: A new combined Izod and Charpy testing machine by W. & T. Avery, Ltd.



Left: High-speed aircraft rescue saw in action (A. C. Morrison, Engineers, Ltd.)

Wright table surface grinder

sories, floodlighting equipment, searchlight projectors and a working model of an electrically driven pithead double drum winder, among many exhibits. Refrigerator compressors, an automatic ice maker, a drinking water cooler and typical lift and escalator equipment can be seen on the stand of J. & E. Hall, Ltd.; and the Cooper Roller Bearing Co., Ltd., include a sectioned model of a Cooper "Safe" friction clutch among exhibits showing the principle of split roller bearings.

Copper for the electrical industry including their patent cellular conductor is shown by Thomas Bolton & Sons, Ltd., and various sizes of shot blasting machine by Tilghmans, Ltd.

Wright Electric Motors, Ltd., have developed a range of surface grinding machines which can be seen on their stand together with their "Rems" electromatic stock driven through a flexible shaft by a reversible motor, which provides a ready answer to producing accurate and reversible threads in construction work. Air operated equipment powered by an electrically operated stationary air compressor can be seen on the stand of the Consolidated Pneumatic Tool Co., Ltd., as well as the modern type of electric tool installation known as the "Hi-cycle" system. Broom & Wade, Ltd., also show compressors including a new rotary compressor and pneumatic tools.

Ransomes, Sims & Jefferies, Ltd., are showing their well-known battery-powered fork-lift trucks in several sizes up to a capacity of 2 tons and also battery-powered tractors with hauling capacities up to 10 tons. A useful although somewhat specialized item shown by A. C. Morrison (Engineers), Ltd., is a portable high-speed aircraft rescue saw unit. This consists of a power unit made up of a 3,000 r.p.m. air-cooled engine developing 6 b.h.p. directly coupled to a 3 kVA 110 V alternator. This generating unit supplies a Black & Decker 12in portable rescue saw which can rapidly cut through the bodywork of an aircraft.

In the field of office equipment Remington-Rand, Ltd., are emphasizing their photo documentation equipment including desk type machines which will copy up to foolscap size and the "Transcript D" equipment which not only copies facsimile size but will produce prints at half size thus effecting a saving in cost and filing space.

A number of establishments connected with the Department of Scientific and Industrial Research are taking part in the exhibition. The Fuel Research Station at Greenwich has an exhibit concerned with the composition of pulverized fuel and the problems of removing deposited ash; and the Mechanical Engineering Research Laboratory at East Kilbride shows among several other exhibits two transparent units demonstrating the advantages of dropwise condensation for increasing the efficiency of condensers in ships and power stations. Greater efficiency leads to a reduction of condenser size.

ASLIB, a Government-sponsored organization which helps industry by arranging access to any information it may require, has a stand explaining its services, as has the Exports Credit Guarantee Department of the Government. This insures the major risks of export trading and is providing a free service at its stand by giving credit rating quotations to exhibitors, generally within the hour, for orders booked or in respect of inquiries received, from overseas customers during the exhibition.

The Royal Navy has a stand showing mainly mechanical equipment although an interesting item is a quarter scale model of a shock machine for testing how electrical equipment can withstand the heavy shocks transmitted to the ship's structure by underwater explosions.

Material Utilization

"Material Utilization in the Metal Working Industries" is the name of a recent publication of the Institution of Production which is available from the Institution at 5s per copy. It is the report of a sub-committee of the Institution's Research Committee, which was set up to investigate the extent to which British industry is making the best use of materials, to discover what proportion is converted into useful products, and to see if ways can be found to increase that proportion.

In this first Report, the sub-committee has confined its investigation to the metal working industries and to metal working. The Report is based on a large number of case studies which were collected from industry, mostly with the help of working parties set up by various sections of the Institution. The report is set out in three main sections:—(a) A general survey of the present position; (b) a large number of illustrated case studies; and (c) conclusions and recommendations. The aim of the sub-committee has been to provide a publication of direct use to the production engineer, with the information set out in a brief and easily digested form. It is the belief of the sub-committee that much can be done by industry to improve the effective utilization of material, and an examination of this report should give food for thought.

Engineering in Europe

Abstracts from Foreign Technical Journals

AMONG the heavy electrical equipment the circuit-breaker is still one element which cannot be entirely designed and calculated for a given performance, as is possible in the case of rotating machinery, transformers, etc. Its actual performance has to be established by tests and the breaker may then still have to be adapted to its duties. Also, it is well known that circuit-breaker testing stations are so costly that even large switchgear firms mostly cannot hope to install them on their own account.

An interesting new development in the field of air-blast breakers was initiated when it was found that this type is actually suitable for being built up of standardized elements, provided the multiple-break principle is used. For example, a circuit-breaker with two quenching chambers for 70 kV may be built up to a 250 kV breaker by adding four identical quenching chambers and the corresponding number of shunt resistances. The other components of the breakers are also standardized and this is particularly important in the case of the insulator columns the testing of which always sets special problems which are definitely simplified by the adoption of a standard type and size of insulator. The circuit-breakers are of the out-door type and the electrical and mechanical tests have to be supplemented by climatic tests to make sure that the external elements are resistant to the most unfavourable atmospheric influences.—" The Possibilities of Adapting Air-Blast Circuit-Breakers to the Service Conditions of Power Systems," P. Bordeaux, *R.G.E.*, Vol. 64, No. 4, pp. 190-193, April, 1955, in French.

Porosity in Varnish Coatings

The methods of testing porosity so far known and used are mostly based on diffusion of salt solutions and therefore very wasteful of time, and yet their results are not always reliable. Electrical breakdown methods, on the other hand, cannot be used for determining the number of pores per unit area with any certainty.

The new method presented is based on a corona discharge produced on a metallic support forming the second electrode. A high voltage (5,000 V) applied to the point electrode produces ionization in the pores of the varnish coating and the excited ions exhibit luminosity in the dark. It is actually possible to count these illuminated pores under a " telemicroscope " directed towards the area under the point electrode at an angle which excludes optical interference by the luminosity of the corona discharge itself. It was found that pores of a size of 4-6μ are detectable.

Since the counting of the numbers of pores is fairly quickly done, the method is definitely non-destructive, in contradistinction to the conventional methods. It was proved beyond doubt that the discharge itself is incapable of perforating a varnish layer and a coating absolutely free of pores is established objectively by the absence of a corona discharge and current. The method is also suitable for examining moisture-proofing packaging materials like cellophane, etc.—" A Method for Detecting Pores in Varnish Coatings and Other Insulating Layers," C. H. Hertz, *Z. angew. Phys.*, Vol. 7, No. 4, pp. 183-187, 1955, in German.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

Drying Out of Machines

The requirement of a thorough drying of an electrical machine often clashes with the limited time available for drying new machines and with the limitation of the permissible drying temperatures. Also, the criterion of successful drying mostly used is the d.c. insulation resistance which with decreasing moisture content of the insulation tends towards a constant limit. It is shown by d.c. and a.c. measurements on machines as well as coils and bars that the insulation resistance under service conditions is independent of the voltage. Its temperature relation is an exponential law, which enables insulation resistances measured at different temperatures to be compared.

Moisture affects the d.c. resistance more than the dielectric loss factor. This renders the d.c. resistance a more sensitive criterion of the condition of the insulation than the loss factor. Measurements as well as operational experience confirm the existence of a simple relation between the insulation resistance of a new machine, the rated voltage and the slot number. Differences in slot size, special designs of the joints between slot and end insulation, corona protection of the end connections, etc., are considered by a correction factor of the order 10^{-4} ohm/V. Breakdown tests on thoroughly wet machines confirm the high degree of moisture-resistance of modern machine insulations.—" The Drying of Electrical Machines," A. Wichmann, *E.T.Z.(A)*, Vol. 76, No. 10, pp. 340-347, 11th May, 1955, in German.

Ultrasonic Insulator Testing

In general, ultrasonic testing of porcelain insulators has proved to be a very useful and convenient method for detecting cracks, air occlusions or porous parts in porcelain insulators but even this method had its limitations, since it could be applied only to homogeneous materials and not to composite bodies cemented together. Above all, the parts of the insulators covered by metal caps could not be tested and this limitation was removed only by the improvement described by the author.

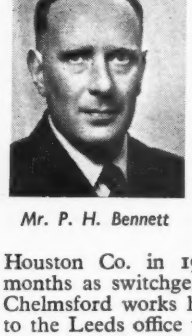
The solution of the problem was found in a new type of applicator or emitter, the output of which penetrates the porcelain body tested in a fairly wide cone which is reflected in a sound insulator at its end face, but in the case of a thoroughgoing fracture, at the fracture itself (at least partly). The " end echo " is in most cases so clear and well defined that the echo produced by a fault can be used to indicate the distance of the fault from the end face. In the case of multiple faults, several echoes are visible. The only condition of the application of the method is that the applicator can be placed on the cylindrical (or slightly conical) part of the insulator between cap and shed, which will mostly be possible.—" Non-Destructive Testing of the Reinforced Ends of Long-Rod Insulators by the Ultrasonic Echo Method," H. Barthelt and W. Böhme, *Siemens-Z.*, Vol. 29, Nos. 5/6, pp. 206-208, May, 1955, in German.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

At a board meeting held on 24th August, the directors of Gent & Co., Ltd., appointed **Mr. R. Swift,** M.I.P.E., to be managing director in succession to the late Mr. H. Kelvin Parsons. Mr. Swift who was educated at the Wyggeston School and Leicester Technical School, commenced his career with Gent & Co., Ltd., in 1920. To gain further experience, Mr. Swift spent a short period with Taylor, Taylor & Hobson, Ltd., and T. Grieve & Co., Ltd., as toolmaker, returning to Gent & Co., Ltd., in 1928 as machine shop foreman. In 1940 he was made production manager and two years later became works manager. Mr. Swift was appointed works director in 1946.

Mr. P. H. Bennett, switchgear sales engineer at the Leeds branch of Crompton Parkinson, Ltd., has moved to the London branch office to replace **Mr. H. J. P. Smith,** who has resigned after 20 years' service with the company. Mr. Bennett joined Crompton Parkinson from the British Thomson-Houston Co. in 1947 and after 18 months as switchgear engineer at the Chelmsford works he was transferred to the Leeds office with responsibility for sales of switchgear and transformers.



Mr. P. H. Bennett

Mr. Bennett's duties at Leeds have now been taken over by **Mr. J. R. Harbottle** from the company's Sheffield sub-office. Mr. Harbottle joined Crompton Parkinson in 1953. He graduated in electric power engineering at the University of London and served a graduate apprenticeship with the General Electric Co.

Mr. S. H. Parker has resigned his position as general sales manager of Sunvic Controls, Ltd., to take up an appointment as general manager of Teddington Industrial Equipment, Ltd.

Mr. F. H. Schroeder, director of Lancashire Dynamo Holdings, Ltd., is to make an extended overseas visit of several months' duration, covering all countries in Central and South America and the Caribbean, on behalf of the Lancashire Dynamo group of companies. He will be accompanied by Mrs. Schroeder and will leave this country by the R.M.S. *Andes* at the end of September, returning in February next.

Mr. W. Holttum, M.Eng., M.I.E.E., retired on 31st August from British Insulated Callender's Cables, Ltd., having been with the company and the pre-merger British Insulated Cables, Ltd., throughout his career. Since the merger, Mr. Holttum has held a somewhat roving commission, devoting himself largely to matters needing special attention, such as the "continuous flow" installation on the Edinburgh 33 kV cable system, and his recent I.E.E. paper on the installation of cables in hooks and cleats.

Mr. Holttum was educated at Birkenhead Institute and Liverpool University. After workshop experience with Dick Kerr & Co., Preston, he joined British Insulated & Helsby Cables, Ltd. (later British Insulated Cables, Ltd.) in 1914 as a contract department engineer, later becoming technical assistant on the head office contract department staff, and (in 1937) chief assistant to the chief engineer. He was chairman of the Mersey and North Wales (Liverpool) Centre of the I.E.E. in 1939-40.

The South of Scotland Electricity Board has appointed **Mr. Maurice P. Henzell,** M.I.E.E., Assoc.I.Mech.E., M.Inst.F., M.Inst.W., to be operation and maintenance engineer (generation) at head office. After an apprenticeship with C. A. Parsons & Co., Ltd., Mr. Henzell was with the Mid-Cumberland Electricity Co., Ltd., and the Electrical Distribution of Yorkshire, Ltd. From 1936 to 1946 he held various appointments in the Generation Department of the Yorkshire Electric Power Co., finally becoming senior technical engineer. In 1946 Mr. Henzell was appointed station superintendent at Bonnybridge and Falkirk generating stations and in 1948 he became superintendent of the Portobello generating station.

Mr. Robert E. Gleadow, district commercial engineer with the South Eastern Electricity Board at Tunbridge Wells, has been appointed district consumers' engineer at Bolton (North Western Electricity Board). Mr. Gleadow, who has been at Tunbridge Wells since 1951, was trained in Hull and has held appointments with the Hull Corporation Electricity Department and the Yorkshire Electricity Board.

Mr. William Maddison, an assistant district consumers' engineer at Macclesfield (N.W.E.B.), has been appointed consumers' engineer to that District. Aged forty-two, Mr. Maddison was trained with the Trent Valley & High Peak Electricity Co. and was later with Northern Light Industries, Ltd., Chester, and Macclesfield Electricity Department. In 1949 he was appointed assistant district consumers' engineer at Stockport, returning to Macclesfield in 1954.

Mr. W. D. Ramsay, B.Sc., A.M.I.E.E., has been appointed commercial engineer to the Uganda Electricity Board. Mr. Ramsay obtained a degree in electrical engineering at Glasgow University. Since his apprenticeship and three years' service in the Industrial Engineering Department of the British Thomson-Houston Co., Ltd., Rugby, he has been for several years with the North of Scotland Hydro-Electric Board as assistant to the chief commercial engineer.

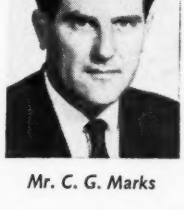
Mr. J. Wells, F.C.I.S., A.A.C.C.A., has been appointed deputy secretary to the Uganda Electricity Board. He is at present assistant secretary to the South of Scotland Electricity Board.

Dame Caroline Haslett and **Lt.-Col. E. H. E. Woodward** have been reappointed part-time members of the Central Electricity Authority.

Mr. G. A. S. Nairn has been reappointed a part-time member of the Merseyside and North Wales Electricity Board.

Mr. A. W. Brace has taken charge of the surface finishing activities of the Chemical Division of Aluminium Laboratories, Ltd., Banbury.

Mr. C. G. Marks has been appointed general manager to the British Central Electrical Co., Ltd., in addition to his duties as company secretary.



Mr. C. G. Marks

Mr. W. Bamford, B.Sc., M.I.E.E., is relinquishing his position as director of sales with Everett, Edgcumbe & Co., Ltd., on 17th October to take up the appointment of general sales manager with Hilger & Watts, Ltd.

Mr. C. W. F. Cozens has received a presentation to mark his retirement from the post of general manager of the Teesside Railless Traction Board, South Bank-on-Tees. The new general manager is **Mr. J. L. Flynn,**

formerly Mr. Cozens' assistant. Mr. Flynn, who is forty-eight years old, joined the Board in 1925.

Thorn Electrical Industries, Ltd., announce new appointments to the boards of their subsidiary companies as follows:—Ferguson Radio Corporation, Ltd.: **Messrs. S. T. Holmes, C. E. Payne** and **W. T. White.** Lamp Presscaps, Ltd.: **Mr. A. J. Ford.** Manifold Machinery, Ltd.: **Messrs. A. J. Ford** and **G. Sparrow.** Smart & Brown, Ltd.: **Mr. D. A. Neill, Dr. J. W. Strange** and **Mr. J. G. Strowger.**

Mr. S. T. Holmes

Mr. W. T. White

Mr. J. G. Strowger

Mr. S. T. Holmes, who is now publicity manager of the Thorn group, has been closely connected with the activities of the organization for more than twenty-five years. Mr. W. T. White has graduated from production supervisor over a similar period to general works manager of the Electronics Division, and Mr. C. E. Payne has been chief engineer of the Electronics Division since 1945.

Mr. J. G. Strowger is chief accountant of the Thorn organization, Dr. J. W. Strange is an internationally known expert in the field of luminescence and lighting engineering generally, and Mr. D. A. Neill is works manager of the Spennymoor factory which is the second largest manufacturing unit of the Thorn organization. Mr. A. J. Ford, general works manager of lamp production, is in charge of the company's ten lamp manufacturing units, including overseas activities in the Commonwealth, and Mr. G. D. Sparrow is chief of the company's Mechanical Development Division and is at present in the United States in connection with the recently announced cathode-ray tube project.

The Brush Group, Ltd., has made the following appointments in its subsidiary companies:—

Mr. D. W. Mansell, at present vice-president of Brush Aboe Inc., New York, is to become sales manager of the National Gas & Oil Engine Co., Ltd., and director of National Oil Engines (Export), Ltd., this month. He will be responsible for the sale of all National products and will operate from the company's works at Ashton-under-Lyne. When Mr. Mansell assumes his new duties, **Mr. F. D. Langley,** a director of National Oil Engines (Export), Ltd., will become London manager of the National Gas & Oil Engine Co.

Mr. A. A. King, at present engine sales representative of the Brush Group in the Far East, takes over Mr. Mansell's duties as vice-president of Brush Aboe Inc., New York, and **Mr. D. M. Muirhead,** at present personal assistant to Mr. M. C. Clear, group sales director, assumes Mr. King's responsibilities in the Far East.

Mr. R. V. Powditch, O.B.E., T.D., A.M.I.E.E., Assoc.I.Mech.E., has recently resigned from the position of sales manager, f.h.p. motors, with Crompton Parkinson, Ltd., to become general manager of a new division of Wilkins & Mitchell, Ltd., Darlaston, Staffs.

Mr. T. McLauchlan, managing director since 1939 of Steatite & Porcelain Products, Ltd. (a subsidiary of Imperial Chemical Industries, Ltd.), retired on 31st August. He has been succeeded by **Mr. G. H. Halton,** A.M.I.E.E., who joined the company in 1929 and has been sales manager since 1938 and a director since 1946. Other appointments are **Mr. G. P. Britton,** B.Sc., to be director responsible for sales and development, **Mr. R. B. Comber,** A.M.I.E.E., to be sales manager (high tension department) and **Mr. C. D. Davies** to be sales manager (low tension department).

We regret that in our note on **Mr. R. O'Donoghue** in last week's issue it was stated that he joined Wild-Barfield Electric Furnaces, Ltd., in 1945; actually it was in 1954.

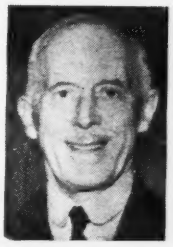
OBITUARY

Mr. H. L. Kirke.—The death occurred last week of Mr. Harold Lister Kirke, C.B.E., M.I.E.E., who, until his retirement through ill-health in 1952, was assistant chief engineer of the British Broadcasting Corporation; he was sixty years of age. After serving as a signals officer in the Army during the 1914-18 war Mr. Kirke joined the Marconi Co. in 1920 and was one of the pioneers of the Writtle broadcasting station. He went to the B.B.C. in 1924, becoming head of the Development Department (later the Research Department) in 1925. In 1949 he became responsible for the co-ordination and direction of the technical work of the specialist departments and in 1950 he was appointed assistant chief engineer of the B.B.C.

The late Mr. H. L. Kirke

Mr. Kirke was a Fellow of the British Institution of Radio Engineers, the Physical Society and the Royal Society of Arts and he had been chairman of the I.E.E. Radio Section. He was made a C.B.E. in 1947.

Brig.-Gen. R. F. Legge, C.B.E., D.S.O., Companion I.E.E., who died in France recently at the age of eighty, was a former general manager and director of the British Power & Light Corporation and director of the North Wales Power Co. and Electricity Distribution of North Wales. He was also a director of the Britannic Electric Cable & Construction Co., Ltd., and the Pitter Gauge & Precision Tool Co., Ltd. He was president of the Incorporated Association of Electric Power Companies in 1943-44.



The late Brig.-Gen. R. F. Legge

Brig.-Gen. Legge was educated at St. Paul's School, London, and had a long Army career during which he served in the South African and 1914-18 wars.

Mr. Edmond Keane, head of Eeto Insulations, Bolton, has died following an emergency operation. Mr. Keane was sixty-two. Up to 1945, when the present title was adopted, the firm was known as P. Higson & Co.

WILLS

Mr. J. Eustace, A.M.I.E.E., for many years chief engineer of the Electric Supply Corporation, who died on 20th March last, left £17,515 gross (£17,198 net).

Mr. J. T. Allen, A.M.C.T., A.M.I.E.E., of Lancashire Dynamo and Crypto, Ltd., who died on 2nd April last, left £3,717 gross (£3,587 net).

Mr. J. S. Simmons, formerly advertising manager of W. T. Henley's Telegraph Works Co., Ltd., who died on 8th March last, left £2,902 gross (£2,822 net).

Mr. R. V. Macrory, M.B.E., M.I.E.E., city electrical engineer of Londonderry, who died on 31st October last, left estate in Great Britain and Northern Ireland valued at £12,309.

Mr. G. L. Bradley, formerly district representative at Hexham for the North-Eastern Electric Supply Co., Ltd., who died on 1st April last, left £9,918 gross (£9,018 net).

Mr. S. G. C. Russell, M.I.E.E., F.R.E.S., of Cranleigh, Surrey, who died on 28th May last, left £6,353 gross (£6,266 net).

Mr. W. Marsh, M.I.E.E., engineer and manager of Brighton Corporation Tramways Department, 1905-38, who died on 26th March last, left £14,267 gross (£14,096 net).

Mr. S. H. Taylor, late a director of Bagdad Light & Power Co., Ltd., and formerly a director of Cawnpore Electric Supply Corporation, Ltd., Delhi Electric Supply and Traction Co., Ltd., Madras Electric Supply Corporation, Ltd., and Madras Electric Tramways (1904), Ltd., who died on 8th May last, left £68,280 gross (£66,874 net).

Mr. C. A. Lloyd, formerly manager of the Ships' Electric Fittings Department, William McGeoch and Co., Ltd., who died on 16th April last, left £2,404 gross (£2,361 net).

Nuclear Research in India

From Our Own Correspondent

As part of the Government of India's plan to develop nuclear research throughout India, Calcutta's Nuclear Physics Research Institute has drawn up an ambitious scheme for furthering research, envisaging an expenditure of Rs.6 million.

The development programme lays special stress on research and training of personnel. Training facilities would be expanded to take in about 20 persons for undergoing training in experimental and theoretical methods in nuclear science for a 20-month period. These students would later be absorbed in the Government of India's Atomic Research Department and by other bodies interested in the development of this subject. The Institute has itself designed India's first synchrotron to produce electrons of high energy up to 50 million volts. Its cost is put at about Rs.1 million.

Atomic Reactor

Meanwhile, the Soviet Union is prepared to offer to India an atomic reactor, ancillary nuclear equipment and the necessary technical assistance. The offer was made to Dr. Meghnad Saha, Director of the Institute of Nuclear Physics, Calcutta, while in the Soviet Union recently, by officials of the Soviet Academy of Sciences.

Dr. Saha has communicated the Russian offer to India's Prime Minister, Mr. Jawaharlal Nehru. Dr. Saha is reported to have suggested that the same consideration be given to the offer made by an American company to install two reactors, one at Bombay and the other at Calcutta.

Mr. Nehru referred to this offer when he said in the Lok Sabha in New Delhi that some Indian scientists engaged in atomic research would soon visit the Soviet Union to discuss the Soviet offer of assistance in atomic research in India. He told the Sabha that India was in close touch with about a dozen nations, including the United States of America, the United Kingdom, the Soviet Union, France, Canada, Norway, Israel and Egypt for co-operation and collaboration in atomic research and has formal agreements with some of them.

The assistance received was in the nature of facilities for training of Indian personnel, supply of literature, technical knowledge of processes, procurement of specialized equipment, etc., and supply of fuel elements for reactors.

According to Professor M. S. Thacker, Director of the Indian Institute of Science, in addition to the nuclear reactor now being set up in Bombay, the Government is thinking of obtaining a second plant shortly. Professor Thacker, who is soon to take up the post of Director of Industries and Scientific Research in New Delhi, said that though harnessing atomic energy was an expensive process, research had indicated the possibility of producing cheap power in the next ten years.

The reactor which is being built at Bombay is expected to be commissioned by the end of the year. It will be initially capable of producing 2,000 kW of power. The heavy water needed for this reactor has been obtained from the United States. In the next four or five years, however, India is expected to produce heavy water when the Bhakra-Nangal region goes into full production, yielding 250,000 tons of nitro-limestone, fertilizer and from five to six tons of heavy water annually.

Research in India is being directed to the use of thorium as an alternative to uranium for fuelling atomic reactors. While India is short in high-grade uranium, it has the world's biggest thorium resources deriving from an estimated 2,000,000 tons of monazite-bearing sands in Travancore, South India, which contain about 10 per cent thorium.

India has a 15-year agreement with the French Banque Marocaine de Credit and the Société de Produits Chimiques des Terres Rares for working the Government-owned factory of Indian Rare Earths, Ltd., at Alwaye in Travancore-Cochin, and at Trombay, Bombay. These factories have a capacity for processing 1,500 tons of monazite annually.

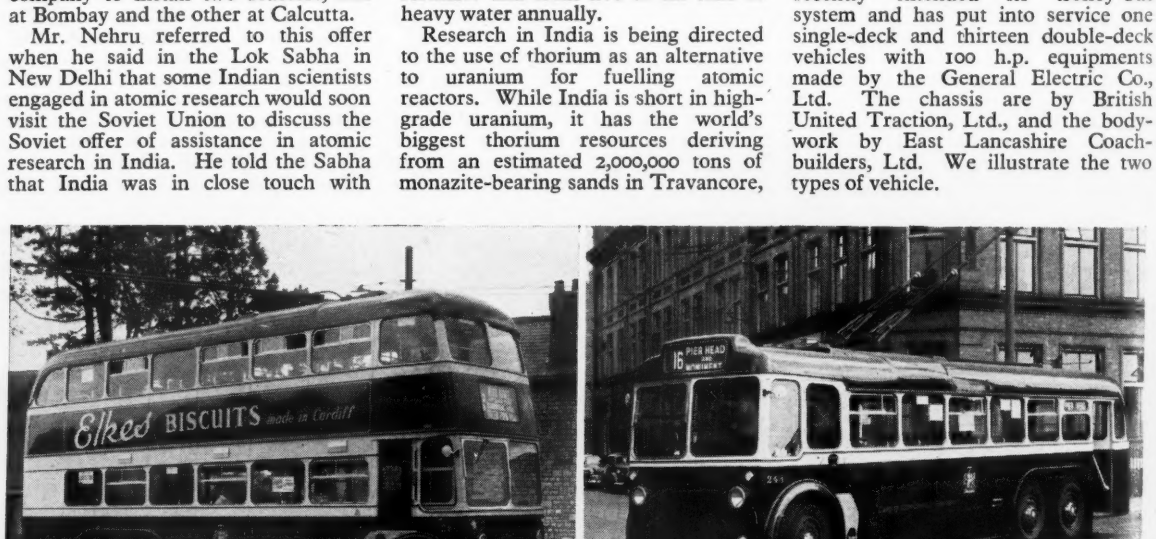
PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £171 0s 0d
COPPER, H.C. Electro	ton £393 10s 0d
Fire Refined 99·70%	ton £392 0s 0d
Fire Refined 99·50%	ton £391 0s 0d
COPPER Tubes ..	lb 3s 7½d
Sheet	ton £449 10s 0d
H.C. wire and strip ..	ton £426 0s 0d
LEAD, English ..	ton £107 2s 6d
Foreign	ton £106 0s 0d
MERCURY	flask £95 0s 0d
TIN, block (English) ..	ton £746 10s 0d
ZINC, G.O.B. Foreign	ton £90 7s 6d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 2s 10½d
Sheet	ton £348 15s 0d
Wire	lb 3s 5½d
PHOSPHOR BRONZE Wire	lb 5s 2½d
PLATINUM	oz £29 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 40½d—41d

TROLLEY-BUSES FOR CARDIFF

The Cardiff Corporation has recently extended its trolley-bus system and has put into service one single-deck and thirteen double-deck vehicles with 100 h.p. equipments made by the General Electric Co., Ltd. The chassis are by British United Traction, Ltd., and the body-work by East Lancashire Coach-builders, Ltd. We illustrate the two types of vehicle.



New Cardiff trolley-buses fitted with G.E.C. electrical equipment

Revised Wiring Regulations

Features of Thirteenth Edition

THE thirteenth edition of the Regulations for the Electrical Equipment of Buildings issued by the Institution of Electrical Engineers (Savoy Place, London, W.C.2) and obtainable from the secretary at 6s in paper binding and 8s 6d in cloth binding, post free, superseded the twelfth edition on 1st September.

The new edition is in two parts. Part 1 is concerned with general requirements in regard to safety from fire or shock, which if not fulfilled would remove the obligation of an undertaking to give or continue to give a supply of electricity to a consumer. Part 2 sets out in detail methods and practices by which the requirements of Part 1 can be met; these are not necessarily the only means of compliance, but any departure from them would have to be especially considered.

Cable Ratings

Included in the new edition are the provisions of the 1954 Supplement relating to the revision of B.S. 7, "Rubber-insulated cables and flexible cords," and the issue of B.S. 2004, "P.V.C.-insulated cables and flexible cords"; cable ratings have been reviewed in consultation with the Electrical Research Association and the Cable Makers' Association. Temporary Relaxation, 1952, regarding the ratings of certain cables and the Abridged Wiring Regulations of 15th November, 1951, are withdrawn. The self-contained "Recommended Practice for Caravan Installations" (1st February, 1954) will continue to be available unless amendments seem desirable later.

The preliminary section on Definitions has been amplified and reference is made to B.S. 205 "Glossary of terms used in electrical engineering." Former Regulation No. 1, which stated "Good workmanship is an essential requirement for compliance with these Regulations" now appears unnumbered as an over-riding condition, set in large type. *Regulation No. 1*, as it now appears, stipulates that every conductor or apparatus shall be of sufficient size and power for its purpose and shall be constructed, installed and protected so as to prevent danger as far as is reasonably practicable.

The other ten Regulations in Part 1 are here summarized as follows:—*No. 2* prohibits the insertion of a fuse or of a non-linked switch or circuit-breaker in a conductor connected with earth and requires that single-pole switches shall be inserted in live conductors only. *No. 3* states that all live conductors, other than those at extra-low voltages (i.e., not exceeding 30 a.c., r.m.s., or 50 d.c.), must be insulated and where necessary further protected or placed so as to prevent danger.

No. 4. Every distinct circuit shall be protected against excess current by an adequate fuse or automatic circuit-breaker, which shall be so located and constructed as to prevent danger from overheating, arcing or scattering of hot metal. *No. 5.* Metalwork not carrying current associated with conductors at above extra-low voltage shall be earthed where necessary to prevent danger. *No. 6.* Every circuit shall be protected against dangerous persistent earth-leakage currents.

No. 7. Effective means, suitably placed for ready operation, shall be provided for cutting off voltage from every part of a system as may be necessary to prevent danger. *No. 8.* Adequate means of access and working space must be afforded for operation of or attention to every piece of electrical apparatus; every switch for starting and stopping an electric motor shall be readily accessible to and easily operated by the person in charge of the motor.

No. 9. Electrical apparatus and conductors exposed to adverse conditions such as weather or corrosive atmospheres shall be constructed or protected appropriately so as to avoid danger. Exposure to inflammable or explosive surroundings entails the use of a standard flameproof enclosure or other construction having intrinsically safe characteristics.

No. 10. No addition, temporary or permanent, may be made to the authorized load of an installation unless the current rating and condition of any associated existing apparatus (including that of the supply undertaking) and the earthing arrangements have been shown to be adequate.

No. 11. Conductors and apparatus operated at a voltage between conductors or to earth exceeding low voltage, i.e., 250 V, shall be completely enclosed in electrically continuous earthed metal protected against mechanical damage. Alternatively, they may be so constructed, installed and protected as to prevent danger so far as is reasonably practicable.

Application of Regulations

The Regulations relate solely to the consumers' side of his terminals where a public supply is taken, but an appendix deals with private generating plant and storage batteries. They do not cover those parts of radio, telephone, bell and call or sound circuits not connected to a public or private power supply. The voltage range, whether between lines or to earth, comprises extra-low voltage (see above), low voltage (up to 250) and medium voltage (up to 650), but high voltages in respect of discharge lighting and electrode boilers are also included.

Except where protection against risk of ignition of explosive atmospheres is in question, wiring and current-using equipment for voltages not exceeding 15 V between lines or to earth need not comply with the Regulations; such installations must, however, be segregated from those for higher voltages and any isolating transformer must be installed in accordance with the Regulations. Special requirements may, however, apply where heavy currents are used in extra-low-voltage circuits, as in electroplating. For demands exceeding 100 kVA additional measures may be desirable, particularly regarding protection, for which see Code of Practice CP 321 "Electrical installations—general."

[The Wiring Regulations Committee of 42 members including the Institution president and the chairman of the Utilization Section, both ex-officio, has as chairman Mr. P. V. Hunter and as vice-chairman Mr. Forbes Jackson. Next week's issue of the *Electrical Review* will contain a review of Part 2 of the 1955 Regulations.]

Transport Association Dinner

It is expected that Mr. J. A. Boyd-Carpenter, Minister of Transport and Civil Aviation, and Lord Mancroft will be the principal speakers at the annual dinner of the Public Transport Association at Grosvenor House, London, W.1, on 10th November.

Interference Suppression

PUBLICATION of the British Standard Code of Practice on the general aspects of radio interference suppression (CP 1006) is of particular interest in view of the fact that Statutory Regulations* on the control of interference from electric motors and from refrigerators came into operation yesterday (Thursday). The new Code has been prepared mainly as a guide for dealers, service engineers, and others concerned with the suppression of interference with radio and television reception. The Code is concerned only with interference from electrical apparatus and installations, and does not deal with interference caused by atmospheric disturbances or by apparatus which is intended to generate radio-frequency energy as part of its normal function—for example, other transmitters, receivers and industrial, scientific and medical radio-frequency equipment.

Suppression techniques applicable to the long and medium wave bands, and to the B.B.C. television band (41 to 68 Mc/s) are dealt with in the Code. Although it is expected that these techniques will also be suitable for suppression over the v.h.f. (sound) and alternative television bands (87·5 to 100 Mc/s and 174 to 216 Mc/s), there is insufficient experience in the practical use of suppressors at these frequencies to allow of firm recommendations.

For ease of reference, the Code is divided into seven separate sections, the first one including definitions of terms used in suppression practice. Section 2 discusses the origin and nature of interference. It explains how radio-frequency noise is generated, and details the various ways in which it may be propagated to the receiving installation. Pictures (reproduced by courtesy of the Engineer-in-Chief, General Post Office) are included in this section, showing the effect of certain types of interference upon television reception. Section 3 deals with the recognition, tracing and assessment of radio noise. In Section 4 the steps which can be taken at the receiving end to reduce susceptibility to interference are dealt with. This is an important aspect of the struggle against radio interference, and many listeners would be well advised, before complaining about interference, to make sure that their own receiving installations are as good as can reasonably be expected.

Section 5, which deals with suppression of interference at the source, covers not only the application of suppressors to existing apparatus, but also makes recommendations to designers of equipment which will render that equipment inherently less liable to cause interference. The features which affect the choice and design of suppression components are covered in Section 6. Section 7 deals with the all-important safety aspects of the use of suppression components. Recommendations are given on the maximum nominal capacitance which may safely be used for suppression purposes with various modes of connection, and emphasis is laid on the need for the correct fitting of suppressors and correct wiring.

In the section devoted to the practical applications of suppressors, examples are given of different types of suppression units which have been found necessary and satisfactory for the suppression of interference from various types of devices in both the broadcast and television bands. Details are also given of methods of suppression of interference from gas-discharge electric lamps of various types.

To coincide with the coming into operation of the Regulations the B.S.I. is publishing a revised edition of B.S. 613: Components and filter units for radio interference suppression (excluding devices for traction, marine, and other special equipment). The standard covers suppression components and filter units for use on apparatus operating at normal voltages (e.g., 230 V), and with ratings up to 7 kVA. Although components and filter units made in accordance with the standard are not intended for use on circuits with higher ratings, many of the requirements of the standard will provide useful guidance in constructing suppressors for such circuits. As the title implies, the new standard does not deal with suppression components or units for internal combustion engines or for traction, marine or other special purposes. In connection with these uses reference should be made to the other British Standards dealing with radio interference suppression.

The main differences between the revised B.S. 613 and the 1940 edition are the introduction of requirements governing complete filter units, the amplification of capacitor requirements and tests, and the introduction of clauses dealing with neon-sign suppression inductors. The general principles underlying the use of suppression components, which were formerly covered in appendices to B.S. 613, have now been extended and published separately as the Code of Practice referred to above.

Copies of the Code of Practice (10s) and of B.S. 613 (6s) may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1.

* S.I. 291: 1955, The Wireless Telegraphy (Control of Interference from Electric Motors) Regulations, 1955, and S.I. 292: 1955, The Wireless Telegraphy (Control of Interference from Refrigerators) Regulations, 1955, respectively.

O.E.E.C. Energy Commission

SIR HAROLD HARTLEY, president of the World Power Conference since 1950, is to be chairman of the newly constituted O.E.E.C. Commission for Energy. The other members will be: M. Jacques Desrousseaux (France), Director of Mines; Mr. H. D. Fransen (Sweden), Adviser on Energy to the Swedish Government; Professor F. Giordani (Italy), chairman of the Italian National Council for Nuclear Research; M. H. Niesz (Switzerland), industrialist and chairman of the Swiss National Energy Committee; Mr. G. A. Tuyl Schuitemaker (Netherlands), technical adviser to the Netherlands War Ministry and vice-chairman of the Permanent Council of World Petroleum Congresses; Dr. F. W. Ziervogel (Germany), president of the Essen Chamber of Commerce; and M. Pierre Uri, who has been nominated by the High Authority of the European Coal and Steel Community.

The members of the Commission have been chosen in a personal capacity by reason of their knowledge of the general problems of energy and of their personal standing in the Organization or in their respective countries. The Government of the United States is to send an observer to the meetings of the Commission.

The duty of the Commission as laid down by the O.E.E.C. Council is:—(a) To collect and collate all useful information concerning the requirements and resources of the member countries in all forms of energy, both in the recent past and, wherever possible, in future years; (b) to examine the chief problems, in particular the economic and financial problems, which may arise for member countries in this respect, and to compare the methods that member countries employ or expect to employ to resolve them; and (c) to formulate proposals for finding still better solutions for these problems by means of co-operation within the Organization.

The Commission will not deal with questions relating to the use of nuclear power until the O.E.E.C. Council so decides in the light of the report of an O.E.E.C. Working Party on nuclear energy set up on 10th June. The Commission is expected to start its work in September, and will submit a report to the Council of O.E.E.C. before 1st March next.

VIEWS on the NEWS

By REFLECTOR

ALREADY the prospect of the early provision of electricity by nuclear power is beginning to influence local authorities in the choice between gas and electricity in council houses. At least this is the impression I gain from Press reports published last week. At a meeting of the Crayford (Kent) Council when a report by the surveyor was being considered one of the members (a former chairman) counselled preparation for the future "when electricity for the people's homes will come from atomic energy." The surveyor reported that a saving of £12 per house could be made by doing away with conventional fireplaces and flues and making the houses all-electric. It was decided to equip 80 new council flats with electric cooking, heating and lighting as an experiment.

It is a wise move to begin to do away with fireplaces and their attendant extra cost when it seems that coal for domestic purposes is inevitably "on the way out."

* * *

I have received from the Light Railway Transport League a copy of a booklet which it has produced in conjunction with the Manx Electric Railway Co., Ltd., to celebrate the diamond jubilee of the Snaefell Mountain Railway. When it was opened in 1895 this was claimed to be the first electrically-operated mountain railway in the British Isles and is the only one to-day. The track gauge is 3ft 6in with a centre rail for guiding and braking; the cars rely solely on ordinary adhesion in ascending the one-in-twelve gradient of the mountain. The original power station housed five 120 h.p. Mather & Platt horizontal compound engines coupled to 60 kW generators (550 V d.c.) made by the same company. Power is taken from overhead lines by twin-bow collectors mounted at each end of the cars. The six original cars, each driven by four 25 h.p. motors, are still in service but the power comes from the public supply.

* * *

Although the Snaefell Railway is still going strong, another early electric "mountain" railway is closing down this year despite the efforts of light railway societies to prevent this from happening. This is the Llandudno and Colwyn Bay Electric Railway which has been operating since 1907 but apparently can no longer meet oil-bus competition. It has six miles of 3ft 6in track and runs from the West Shore, Llandudno, to Colwyn Bay over the slopes of the Little Orme. The before-mentioned societies are endeavouring to raise funds to secure its continuance during the summer months.

* * *

One of the most interesting of company chairman's addresses which I have seen lately is that of Mr. C. O. Stanley, of Pye, Ltd. In this, Mr. Stanley surveys the world from China to Peru (almost) and brings in quite a number of unexpected subjects—luncheon vouchers and locomotives for instance—as well as topics more closely related to the company's business. He regards luncheon vouchers as a possible violation of the Truck Acts, which were designed to prevent the payment of wages in goods obtainable only from establishments linked with the employers' business. He objects to the cost of the vouchers being chargeable as business expenses, as giving an advantage to firms who prefer to use the system rather than provide staff canteens. Only canteen losses, he says, can be charged for tax-relief purposes.

* * *

Correspondence in the *Daily Telegraph* on the underground-cable *v.* overhead-line controversy, to which I referred last week, has continued. One writer says:—

> "When I was a boy, the streets of London and of the big cities were festooned with telephone wires, while along all the main roads throughout the countryside were columns of telegraph poles and masses of wire. To-day these are all out of sight."

I think this correspondent must have travelled in different parts of the country from those which I have seen.

Another letter (on the other side) sees in a line of "pylons" crossing undulating downland "a many-masted ship voyaging across a rolling sea with its precious and necessary cargo." It all goes to prove that beauty lies in the eyes of the beholder.

* * *

In the early days of electricity supply the name "Willans & Robinson" was a power station household word; the firm's steam engines were claimed to have made the generation of electricity a commercial possibility. In an article on the firm (whose works at Rugby are now part of the English Electric Company's organization) "English Electric and Its People" says that that claim was never challenged. The Willans central-valve engine was originally designed for marine propulsion but with suitable modifications it was widely adopted for driving generators; it is believed that something like 2,000 central-valve engines were made at the company's Thames Ditton (Surrey) works but soon after the establishment of the Rugby works the growing influence of the steam turbine made itself felt and an early chapter in electrical history was ended.

* * *

Accumulator battery traction had quite a long run towards the end of the last century and the beginning of this but it was occasionally troublesome and uneconomical. One of the directors of the Birmingham Central Railways was reported in the *Electrical Review* of 30th August, 1895, as saying that "so long as they worked this line by electricity on the accumulator system, so long would they have a millstone round their necks which would drag them to the ground." Strangely, in spite of his dictum, and after mentioning some of the company's troubles, he went on to say:—

> "They now had a favourable contract for the supply of batteries and when they had had sufficient time to prove the working of this contract, he thought they would be able to show better results."

Domestic Electrical Equipment

Electric Cookers

ONE of the "Four Foundations of Modern Living," popularized by the Electrical Development Association, the electric cooker, is no doubt the most useful, if not the most important electric domestic appliance in the home. Absence of fumes, coolness in use, and the fact that there are fewer projections to collect dirt and dust are only some of the points which commend this form of cooking to the modern housewife.

The tendency towards automatic operation continues and since our last survey one or two new models have appeared on the market—notably the "Creda Carefree" and the English Electric raised oven model. The latter has a dual-purpose grill which acts as a booster for pre-heating the oven and consequently it is claimed to have the fastest heating oven, rising to 400 deg F in eight minutes or half the normal time.

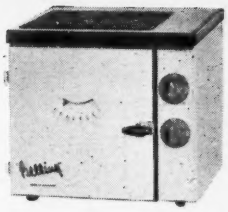
Although the last-mentioned cooker incorporates an all-radiant plate hob, as do several other makes, the standard fitting on most models is the solid hotplate, radiant plates being optional at extra cost.

Plinth models appear to be gaining in popularity although there are still cookers with legs for those who prefer them. Prices are slightly higher than a year ago, approximately 5 per cent up, but nevertheless, being free from purchase tax, the electric cooker still cannot be considered expensive.

Manufacturer	Name or Model	Type	Size (H.W. & D. in inches)	Oven Type	Oven Size (H.W. & D. in inches)	Oven Loading	Type of Element	Oven Control
BELLING & CO., LTD., Southbury Road, Enfield, Middlesex.	64AB Streamline	Vertical	37×23½×23	Removable one piece	16×15×13	3·4 kW	—	Thermostatic
	47AB	Vertical	36×21×21	Removable one piece	13×13×16	2·5 kW	—	Thermostatic
	45A "Baby Belling"	"Baby"	20×15⅛×18	Fixed	11⅛×13×13	1·2 kW	—	Three heat
	51 "Wee Baby Belling"	"Baby"	11¾×11⅛×13¾	Fixed	9¼×9×9¼	600 W	—	Three heat
	53 "Big Baby Belling"	Stand or cabinet	36×21×16	Fixed	11⅛×11⅛×11⅛	1 kW	—	Three heat
	29	Table	9×16½×12	—	—	—	—	—
BRITISH NATIONAL ELECTRICS, LTD., Newarthill, Motherwell, Scotland.	C.90	Vertical, plinth	36×21×21	Fixed	13⅛×13⅛×15	2·5 kW	Speedheat, open type on skeleton mounting	Thermostatic
	C.49/3	Vertical, plinth	36×21×21	Fixed	13⅛×13⅛×15	2·2 kW	Open type on skeleton mounting	Thermostatic
	C.49/2	Vertical, plinth	36×21×21	Fixed	13⅛×13⅛×15	2·2 kW	Open type on skeleton mounting	Thermostatic
	C.51/3	Vertical, plinth	36×21×21	Fixed	13⅛×13⅛×15	1·8 kW	Open type on skeleton mounting	Thermostatic
	C.51/2	Vertical, plinth	36×21×21	Fixed	13⅛×13⅛×15	1·8 kW	Open type on skeleton mounting	Thermostatic
	CS/3	Vertical, legs	36×21×21	Fixed	13⅛×13⅛×15	2·2 kW	Open type on skeleton mounting	Thermostatic
	CS/2	Vertical, legs	36×21×21	Fixed	13⅛×13⅛×15	2·2 kW	Open type on skeleton mounting	Thermostatic
CARRON CO., Carron, Falkirk.	L.2	Vertical, legs or plinth	36×22×21	Fixed with single element in bottom	12⅜×14⅞×14	2·4 kW	Plug-in special finned sheathed type	Thermostatic

Carron L.2

Belling 47AB



" Wee Baby Belling "

British National Electrics C.90

Hot Plates	Grill or Grill Boiler	Hot Cupboard or Grill Compartment (H.W. & D. in inches)	Storage Drawer (H.W. & D. in inches)	Storage Drawer Loading	Special Features	Finish	Price
One 8in 2½ kW One 6in 1 kW " Simmerstat " controlled	10½×8in 2·3 kW grill boiler	7×16½×16½	—	—	Inner glass door, automatic oven floodlight and (as extra) wheels with brake	White or cream, black hob, vitreous throughout	£52 10 0
One 8in 1·8 kW (" Simmerstat " controlled) and one 6in 1 kW (three-heat control)	10½×8in 2·3 kW grill boiler	6×18½×15½	4×16×15	—	Inner glass door	White or cream, black hob, vitreous throughout	£34 5 0
—	10½×8in 2 kW grill boiler	4½×17½×15	—	—	Available on stand (£2 4 0 extra) or cabinet (£4 8 0 extra)	White or cream, black hob, vitreous throughout	£14 17 6
—	9×7in 1·75 kW grill boiler	—	—	—	—	Cream and black vitreous enamel	£7 19 6
One 8in 1·8 kW	10×7in 2 kW grill boiler	5×19×14	—	—	Switch interlock limits load to 3 kW	Cream and black vitreous enamel	£19 17 6 (on stand) £21 17 6 (on cabinet)
—	10½×8in 2 kW grill boiler	7×10⅜×10⅜	—	—	Three heat or " Simmerstat " control	White or cream and black vitreous enamel	£6 18 0 (three heat) £7 12 0 (" Simmerstat ")
One 8in radiant simmer control 1·8 kW one 6½in solid three heat 1 kW	10½×8in 2 kW grill boiler	6⅜×17×17⅜	5⅜×16⅜×17⅜	400 W	Speedheat oven, " Pyrex " casserole/grill pan	Two-tone cream	£50 18 0
One 8in solid 1·8 kW one 6½in solid three heat 1 kW	10½×8in 2 kW grill boiler	6⅜×17×17⅜	—	—	Storage drawer, radiant plates and simmer controls optional extras	Two-tone ivory	£38 9 0
One 8in solid three heat 1·8 kW	10½×8in 2 kW grill boiler	6⅜×17×17⅜	—	—	Storage drawer, radiant plates and simmer controls optional extras	Two-tone ivory	£35 10 0
One 8in solid 1·8 kW One 6½in solid three heat 1 kW	10½×8in 2 kW grill boiler	6⅜×17×17⅜	5⅜×16⅜×17⅜	Not heated	Radiant plates and simmer controls optional extras	Two-tone ivory	£36 8 0
One 8in solid 1·8 kW three heat	10½×8in 2 kW grill boiler	6⅜×17×17⅜	5⅜×16⅜×17⅜	Not heated	Radiant plates and simmer controls optional extras	Two-tone ivory	£33 5 0
One 8in solid 1·8 kW one 6½in solid three heat 1 kW	10½×8in 2 kW grill boiler	6⅜×17×17⅜	—	—	Radiant plates and simmer controls optional extras	Two-tone ivory	£32 8 6
One 8in solid 1·8 kW three heat	10½×8in 2 kW grill boiler	6⅜×17×17⅜	—	—	Radiant plates and simmer controls optional extras	Two-tone ivory	£28 12 6
One 8in solid 1·8 kW three heat or " Simmerstat " control	10½×8in solid 2 kW grill boiler	5×19×15	—	—	Extra wide oven, high splashplates, easy maintenance	Cream with black hob if desired	£27 3 6 (leg) £27 18 6 (plinth)

ELECTRIC COOKERS . . . . . *continued*

Manufacturer	Name or Model	Type	Size (H.W. & D. in inches)	Oven Type	Oven Size (H.W. & D. in inches)	Oven Loading	Type of Element	Oven Control	Hot Plat
CARRON CO., Carron, Falkirk. *(continued)*	L.3	Vertical, legs or plinth	36×22×21	Fixed with single element in bottom	12⅞×14⅝×14	2·4 kW	Plug-in spetial finned sheathed type	Thermostatic	One 8in so 1·8 kW one 6½in so 1·8 kW three heat "Simmerst control
	H.3	Vertical	36×21×21	Removable sides and bottom	15×13½×15½	2·6 kW	Porcelain sections in sheet steel frame	Thermostatic	One 8in 1·8 kW and one 6½ 1 kW soli
	H.2	Vertical	36×21×18½	Removable sides and bottom	13×13¼×14½	2·2 kW	Porcelain sections in sheet steel frame	Thermostatic	One 8in so 1·8 kW
DEXRAY ENGINEERING CO., LTD., 34, Ardwick Green South, Manchester, 13.	C.2	Table	13×22×15	—	—	—	—	—	One 6½in so 1 kW ("Simmerst controlled
	C.8	Table	10×18×15	—	—	—	—	—	One rectang 2 kW soli dual-purpo (three hea
	C.10	Table	8½×20×12	—	—	—	—	—	Two radia 900 W eac on/off swit
ENGLISH ELECTRIC CO., LTD., Queens House, Kingsway, London, W.C.2.	2009D	Plinth	36×22×22½ (plus 6½in splashplate)	Fixed, removable element guards	14×13½×15½	2·8 kW	Two plug-in spirals and two rod type	Thermostatic	One 8in so 1·8 kW ("Simmerst controlled and one 6½in so 1 kW three hea
	2011	Plinth	52½×22×24 (36in to top of hob)	Fixed, removable element guards	14×13½×15½	2·8 kW	Two plug-in spirals and two rod type	Thermostatic	One 8in so 1·8 kW and one 6½in so (both "Simmerst controlled
	2020	Plinth, raised oven	61×25½×26 (30in to top of hob)	Fixed, removable element guards	14⅞×14½×13½	2·5 kW	Two banks of spirals and two rod type	Thermostatic	Two 8in rad 1·8 kW ea and one 6½ radiant 900 W ("Simmerst controlled
FALCO ELECTRICAL APPLIANCES, LTD., Corporation Road, Audenshaw, Manchester.	"Falco-Royal"	Vertical, plinth	49×23×23½ (36in to top of hob)	Removable	16½×17½×15½	3·5 kW	Radiant plug-in	Thermostatic and auto-timer	Two 8in rad 1·7 kW ea and one 6½i radiant 900 W ("Simmerst controlled
FALKIRK IRON CO., LTD., Falkirk.	"Falco-Petite"	Table	15×11¾×12	Fixed	8½×10×8	400 W	Open-coil radiant	Three heat	—
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.	DC114	Vertical, plinth	44×21×21 (36in to top of hob)	Three-piece removable	13×13½×15¼	2·45 kW	Sheathed wire	Thermostatic	One 8in sol 1·8 kW (simmer-swit one 6½in so 1 kW (three hea
	DC752 and DC753	Vertical, legs or plinth	43¾×21×21 (36in to top of hob)	Three-piece removable	13⅛×12⅜×16¾	2·5 kW	Panel type	Thermostatic	One 8in sol 1·8 kW and one 6½in so 1 kW (three hea
	DC754 and DC755	Vertical, legs or plinth	43¾×21×21 (36in to top of hob)	Three-piece removable	13⅛×12⅜×16¾	2·5 kW	Panel type	Thermostatic	One 8in sol 1·8 kW (simmer-swit one 6½in so 1 kW (three hea
	DC452 and DC453	Vertical, legs or plinth	43¾×17×21 (36in to top of hob)	Three-piece removable	13¼×12⅜×14¼	2·25 kW	Panel type	Thermostatic	One 8in sol 1·8 kW (three hea
	DC454 and DC455	Vertical, legs or plinth	43¾×17×21 (36in to top of hob)	Three-piece removable	13¼×12⅜×14¼	2·25 kW	Panel type	Thermostatic	One 8in sol 1·8 kW (simmer-swit
	DC138	Junior Model	14×20×14 (36in with legs and potshelf)	Fixed	10×12×12	800 W	Panel type	Three heat	—

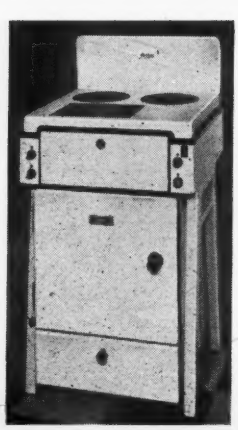
Oven Control	Hot Plates	Grill or Grill Boiler	Hot Cupboard or Grill Compartment (H.W. & D. in inches)	Storage Drawer (H.W. & D. in inches)	Storage Drawer Loading	Special Features	Finish	Price
Thermostatic	One 8in solid 1·8 kW one 6¼in solid 1·8 kW three heat or "Simmerstat" control	10½×8in solid 2 kW grill boiler	5×19×15	—	—	Extra wide oven, high splashplates, easy maintenance	Mottled grey	£29 19 6 (leg) £30 14 6 (plinth)
Thermostatic	One 8in 1·8 kW and one 6¼in 1 kW solid	10½×8in solid 2 kW grill boiler	6½×17¾×18½	5¾×15½×19½	500 W	Glass door, illuminated indicating splashplate, kettle plug attachment, kettle holder and towel rail	Cream with black or green hob	£39 16 6 to £50 6 6
Thermostatic	One 8in solid 1·8 kW	10½×8in solid 2 kW grill boiler	6¾×17¾×12¾	—	—	Illuminated indicating splashplate, kettle plug attachment, kettle holder and towel rail	Cream with black or green hob	£32 9 0 to £40 2 0
—	One 6¼in solid 1 kW ("Simmerstat" controlled)	2 kW grill boiler (three heat)	11×6½×14	—	—	—	Grey mottled top-plate, cream body, black base	£12 5 0
—	One rectangular 2 kW solid dual-purpose (three heat)	—	10×8×13	—	—	—	Grey mottled top-plate, cream body, black base	£8 13 4
—	Two radiant 900 W each, on/off switch	—	—	—	—	—	Grey or black top-plate, cream body, black base	£12 18 4
Thermostatic	One 8in solid 1·8 kW ("Simmerstat" controlled) and one 6¼in solid 1 kW three heat	10½×8in 2·5 kW grill boiler (three heat)	5×18¾×18½	5½×18×17¾	—	Optional glass oven door, cast iron frame	Cream or white	£42 4 0
Thermostatic	One 8in solid 1·8 kW and one 6¼in solid (both "Simmerstat" controlled)	10½×8in 2·5 kW grill boiler ("Simmerstat" controlled)	5×18¾×18½	5½×18×17¾	—	Plug-in control panel, auto-timer, 4-hr ringer and 13 A shuttered outlet	Cream or white	£61 10 0
Thermostatic	Two 8in radiant 1·8 kW each and one 6¼in radiant 900 W ("Simmerstat" controlled)	13×8in 2·5 kW grill in oven ("Simmerstat" controlled)	6½×22×15¾ (400 W)	13¾×22×24 (storage cupboard)	—	Grill "booster" control for rapid oven pre-heating, auto-control oven and hot cupboard	Cream or white	£70 0 0
Thermostatic and auto-timer	Two 8in radiant 1·7 kW each and one 6¼in radiant 900 W ("Simmerstat" controlled)	3 kW grill ("Simmerstat" controlled)	4×17×16	—	—	13 A kettle plug, auto-timer and floodlight in splashplate	Cream or white	£90 0 0
Three heat	—	9×8in 2 kW grill boiler	—	—	—	—	Two-tone cream and brown stoved enamel, black and white mottled interior	£8 5 0
Thermostatic	One 8in solid 1·8 kW (simmer-switch) one 6¼in solid 1 kW (three heat)	10½×8in 2 kW grill boiler	6½×17¾×18½	5½×13½×20	400 W	Auto-timer optional (£12 15 0 extra)	White, two-tone ivory or green and cream	£39 18 0
Thermostatic	One 8in solid 1·8 kW and one 6¼in solid 1 kW (three heat)	10½×8in 2 kW grill boiler (three heat)	6×17¾×15¾	—	—	Radiant hotplates and simmer-switch extra	Two-tone ivory or green and cream	£32 14 0 (legs) £33 17 0 (plinth)
Thermostatic	One 8in solid 1·8 kW (simmer-switch) one 6¼in solid 1 kW (three heat)	10½×8in 2 kW grill boiler (three heat)	6×17¾×15¾	—	—	Radiant hotplates and fuses extra	Grey (legs) and two-tone ivory (plinth)	£30 0 0 (legs) £31 0 0 (plinth)
Thermostatic	One 8in solid 1·8 kW (three heat)	10½×8in 2 kW grill boiler	6×17¾×12½	—	—	Radiant hotplate and simmer-switch extra	Two-tone ivory or green and cream	£28 13 0 (legs) £30 7 0 (plinth)
Thermostatic	One 8in solid 1·8 kW (simmer-switch)	10½×8in 2 kW grill boiler	6×17¾×12½	—	—	Radiant hotplate and fuses extra	Grey (legs) and two-tone ivory (plinth)	£27 0 0 (legs) £27 17 0 (plinth)
Three heat	—	10×8in 2 kW grill boiler (three heat)	—	—	—	Storage cupboard for warming plates	Two-tone ivory or white with black hob	£15 18 0 £12 15 0 (without legs)

ELECTRIC COOKERS . . . . . *continued*

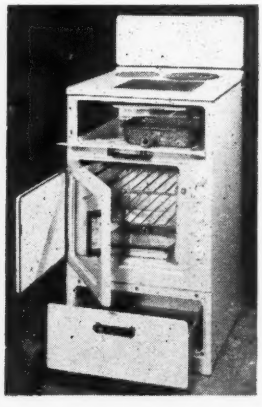
Manufacturer	Name or Model	Type	Size (H.W. & D. in inches)	Oven Type	Oven Size (H.W. & D. in inches)	Oven Loading	Type of Element	Oven Control
L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, London, W.C.2.	LGH600 "Ovenette"	Portable	8×14 diameter	—	—	700 W	Annular channel heating	—
C. HOUNSLOW & CO., LTD., Chalex Works, Southwick, Sussex.	"Regal"	Breakfast	7×9½×12½	—	4×11×8	—	—	—
	"Chalex"	Table	7⅞×17×11¼	—	6¼×11½×10⅛	—	Wide porcelain	Three heat
	"Chalex Bijou"	Table or on stand	19×13×13	Fixed	9×11×11½	1·25 kW	Wide porcelain	Three heat, two switches
JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, London, S.W.1.	69 "Giant"	Table	16×18×18½	Fixed	8½×10×13¼	1·1 kW	Tubular sheathed (base) spirals (top)	Thermostatic
	190J	Vertical, legs or plinth	44½×21×17⅞ (36in to top of hob)	Removable element guards	12⅝×12½×16½	1·78 kW	Plug-in spirals in ceramic tubes	Thermostatic three heat available
	191J	Vertical, legs or plinth	44½×21×21 (36in to top of hob)	Removable element guards	12⅝×12½×16½	2·1 kW	Plug-in spirals in ceramic tubes	Thermostatic three heat available
	192J	Vertical, plinth, drawer	44½×21×17⅞ (36in to top of hob)	Removable element guards	12⅝×12½×16½	1·78 kW	Plug-in spirals in ceramic tubes	Thermostatic
	194J	Vertical, plinth, drawer	44½×21×21 (36in to top of hob)	Removable element guards	12⅝×12½×16½	2·1 kW	Plug-in spirals in ceramic tubes	Thermostatic
	"Two-Ninety"	Vertical, legs	42½×23 5/16×17⅞ (36in to top of hob)	Removable element guards	12⅝×12½×13¾	1·78 kW	Plug-in spirals in ceramic tubes	Thermostatic
	"Two-Nine-Three"	Vertical, legs	44×23½×25½ (36in to top of hob)	Removable element guards	12⅝×12 5/16×16½	2·1 kW	Plug-in spirals in ceramic tubes	Thermostatic
	"Two-Nine-Five"	Vertical, legs	44×23½×25½ (36in to top of hob)	Removable element guards	14½×13⅜×15⅝	2·5 kW	Plug-in spirals in ceramic tubes	Thermostatic

"Falco-Petite" (Falkirk Iron Co.)

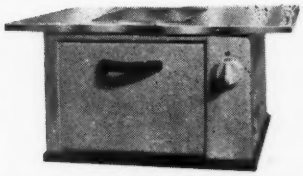
L. G. Hawkins "Ovenette"



Jackson "Two-Nine-Five"



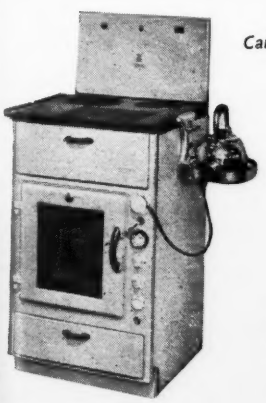
Jackson 194J



Dexray C.8 table cooker

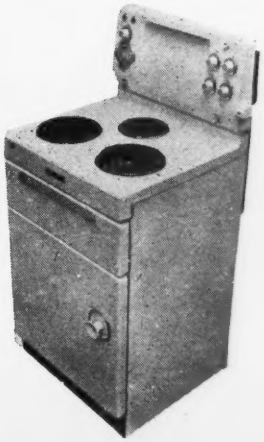
G.E.C. DC114 fitted with auto-timer

Hot Plates	Grill or Grill Boiler	Hot Cupboard or Grill Compartment (H.W. & D. in inches)	Storage Drawer (H.W. & D. in inches)	Storage Drawer Loading	Special Features	Finish	Price
—	Grilling can be done in oven	—	—	—	Viewing cooking window	Aluminium	£4 9 6
—	9×7in 750 W grill boiler	—	—	—	—	Grey mottled stoved enamel	£2 15 10
—	10×8in 1·8 kW grill boiler	—	—	—	—	Grey mottled stoved enamel	£6 18 4
One 5½in 750 W	—	—	—	—	—	Grey mottled stoved enamel	£9 0 7
One 7in radiant (" Simmerstat " controlled)	Grill in top of oven 800 W	10½×5½×13½	—	—	Stand complete with potshelf £1 16 6 extra	Cream and black or white and black	£18 2 6
One 8in solid 1·8 kW (three heat)	10½×8in 2 kW grill boiler	4½×18×13¾	—	—	Auto-control unit, radiant hotplates and " Simmerstats " extra	Grey splash or two-tone ivory with black hob	£28 0 0 (legs—grey splash) £28 11 0 (legs—ivory) £29 14 0 (plinth—ivory)
One 8in solid 1·8 kW one 6½in solid 1 kW (three heat)	10½×8in 2 kW grill boiler	4½×18×18½	—	—	Auto-control unit, radiant hotplates and " Simmerstats " extra	Grey splash or two-tone ivory with black hob	£31 17 0 (legs—grey splash) £32 8 0 (legs—ivory) £33 13 0 (plinth—ivory)
One 8in solid 1·8 kW (three heat)	10½×8in 2 kW grill boiler	4½×18×13¾	6×16½×14½	400 W	Glass oven door, auto-control unit, radiant hotplates and " Simmerstats " extra	Two-tone ivory or all-white	£35 16 0 (cold drawer) £37 15 0 (heated drawer)
One 8in solid 1·8 kW one 6½in solid 1 kW (three heat)	10½×8in 2 kW grill boiler	4½×18×18½	6×16½×19	400 W	Glass oven door, auto-control unit, radiant hotplates and " Simmerstats " extra	Two-tone ivory or all-white	£40 13 0 (cold drawer) £42 9 0 (heated drawer)
One 8in solid 1·8 kW (" Simmerstat " controlled)	10½×8 2 kW grill boiler	5¾×17¼×11	6½×17½×14½	—	Towel rails, rollers on back legs, radiant hotplates extra	Cream with green legs, white with grey legs or all-cream	£26 5 0 (legs) £27 7 0 (drawer)
One 8in solid 1·8 kW (" Simmerstat " controlled) one 6½in solid (three heat)	10½×8 2 kW grill boiler	4⅜×17½×16½	6⅜×17½×17½	—	Towel rails, rollers on back legs, radiant hotplates and " Simmerstats " extra	Cream with green legs, white with grey legs or all-cream	£29 4 0 (legs) £30 6 0 (drawer)
One 8in solid 1·8 kW (" Simmerstat " controlled) one 8in solid 1·8 kW (three heat)	10½×8 2 kW grill boiler	4⅜×17½×16½	6⅜×17½×17	—	Towel rails, rollers on back legs, radiant hotplates and " Simmerstats " extra	Cream with green legs, white with grey legs or all-cream	£32 8 0 (legs) £33 10 0 (drawer)



Carron H.3

Hounslow " Chalex " table cooker



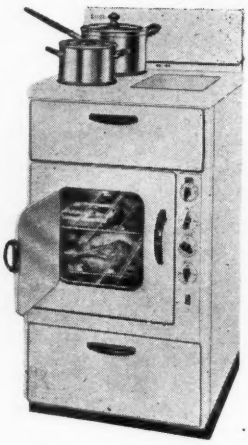
Falco " Royal "

English Electric 2011 automatic cooker

English Electric 2020 raised oven model

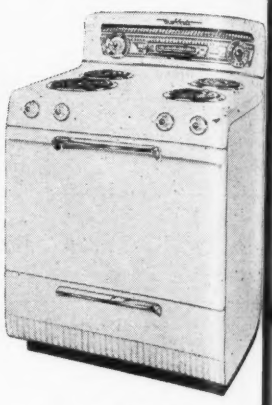
ELECTRIC COOKERS . . . . . *continued*

Simplex "Creda Carefree"



Simplex "Creda" EV.13

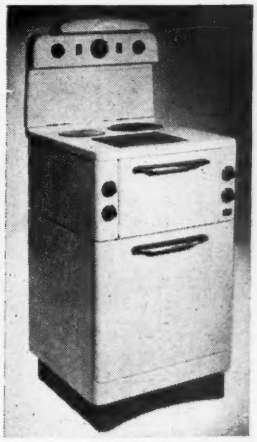
Moffats 3225



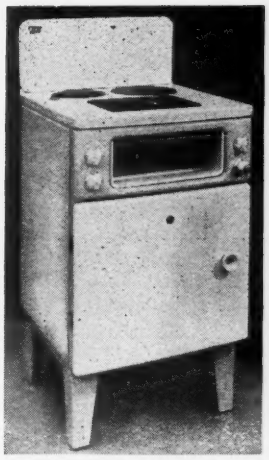
Moffats 304

Manufacturer	Name or Model	Type	Size (H.W. & D. in inches)	Oven Type	Oven Size (H. W. & D. in inches)	Oven Loading	Type of Element	Oven Control
MOFFATS (OVERSEAS), LTD., 1, Newman Street, London, W.1.	3225	Horizontal	44⅝ × 39½ × 25½	Fixed. Two ovens	14 × 16⅝ × 20	Grill: 3 kW Bottom: 1·5 kW	"Conrad"	Thermostatic
	3224	Horizontal	44⅝ × 39½ × 25½	Fixed. Two ovens	14 × 16⅝ × 20	Grill: 3 kW Bottom: 1·5 kW	"Conrad"	Thermostatic
	3144A	Horizontal	44⅝ × 39½ × 25½	Fixed	14 × 16⅝ × 20	Grill: 3 kW Bottom: 1·5 kW	"Conrad"	Thermostatic
	4408	Vertical	48½ × 22⅝ × 25½	Fixed	14 × 16⅝ × 20	—	"Conrad"	Thermostatic
	304	Vertical	45½ × 30 × 25⅝	Fixed	15½ × 24 × 18½	Grill: 3 kW Bottom: 2·4 kW	"Conrad"	Thermostatic
	306	Vertical	45½ × 30 × 25⅝	Fixed	15½ × 24 × 18½	Grill: 3 kW Bottom: 2·4 kW	"Conrad"	Thermostatic
	3165	Horizontal	44⅝ × 39½ × 25¼	Fixed	14 × 16⅝ × 20	Grill: 3 kW Bottom: 1·5 kW	"Conrad"	Thermostatic
	3124	Horizontal	44⅝ × 39½ × 25¼	Fixed	14 × 16⅝ × 20	Grill: 3 kW Bottom: 1·5kW	"Conrad"	Thermostatic
REVO ELECTRIC CO., LTD., Tipton, Staffs.	"Monarch"	Vertical, plinth	48⅞ × 23 × 24 (36in to top of hob)	Removable	14 × 15⅜ × 13⅜	2·1 kW	Sheathed	Thermostatic
	"Regent" 552 and 553	Vertical, legs or plinth	45 × 21 × 21½ (36in to top of hob)	Removable	13⅛ × 13¾ × 14	2·1 kW	Sheathed	Thermostatic
	"Peerless"	Table or legs	17⅞ × 21 × 15½	Fixed	12½ × 11⅛ × 13	Grill: 2 kW Bottom: 900 W	Spiral on ceramic formers	Thermostatic
	"Princess" 461	Vertical, plinth	42 × 21 × 18 (36in to top of hob)	Removable	13¼ × 12½ × 13½	2·1 kW	Spiral on ceramic formers	Thermostatic
	"Princess" 463	Vertical, plinth	42 × 21 × 20 (36in to top of hob)	Removable	13¼ × 12½ × 13½	2·1 kW	Spiral on ceramic formers	Thermostatic
	"Princess" 464	Vertical, plinth	42 × 21 × 21 (36in to top of hob)	Removable	13¼ × 12½ × 16¾	2·5 kW	Spiral on ceramic formers	Thermostatic
	R.808	Vertical, legs or plinth	40½ × 21⅜ × 16½ (35½in to top of hob)	Removable	13½ × 12½ × 13¼	1·9 kW	Spiral on ceramic formers	Thermostatic

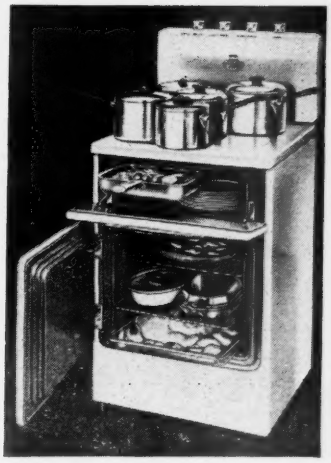
Tricity "Coronet"



Tricity "Queen"



Revo "Regent" 553



Revo "Monarch"

Hot Plates	Grill or Grill Boiler	Hot Cupboard or Grill Compartment (H.W. & D. in inches)	Storage Drawer (H.W. & D. in inches)	Storage Drawer Loading	Special Features	Finish	Price
Two 8in three 6½in	Grill	10×14×21½	10×14×21½	500 W	Automatic control of ovens, hotplates. Floor levelling facilities	White titanium enamel	£153 10 0
One 8in three 6½in	Grill	—	10×14×21½ (two)	—	Automatic oven control	White titanium enamel	£141 5 0
One 8in three 6½in	Grill and handi-broil	14×16⅝×20	10×14×21½	500 W	Separate handi-broil and 3 kW grill. Automatic control	White titanium enamel	£122 10 0
One 8in three 6½in	Grill	—	10×14×21½	500 W	Automatic oven control	White titanium enamel	£89 10 0
One 8 in three 6½in	Grill 3 kW	—	6×21×18	500 W	Automatic oven control	White titanium enamel	£103 10 0
One 8in three 6½in	Grill 3 kW	—	6×21×18	500 W	Automatic oven control	White titanium enamel	£110 10 0
Two 8in three 6½in	Grill and handi-broil	—	10×14×21½	500 W	Separate handi-broil and 3 kW grill. Automatic control	White titanium enamel	£138 10 0
One 8in three 6½in	Grill	14×16⅝×20	10×14×21½	500 W	Automatic oven control	White titanium enamel	£113 10 0
Two 8in solid 1·8 kW each (three heat or "Simmerstat" controlled)	10½×8 2·2 kW grill boiler (three heat)	5½×16⅞×20	4×17½×1[illegible]	—	Eye-level switches, non-tilt racks, large oven. Radiant hotplates extra	Two-tone ivory, white with black hob or cream with black hob	£31 17 0
One 8in solid 1·8 kW ("Simmerstat") 552 one 8in solid 1·8 kW and one 6¼in 1 kW solid (three heat) 553	10½×8 2·2 kW grill boiler (three heat)	5×13×19	8×18×20 (plinth model only)	—	Waist-high switches, wide oven	Grey and white, white with black hob and two-tone ivory	£27 0 0 (552) £29 4 0 (553)
One 6¼in 1 kW ("Simmerstat" controlled)	10×7 2 kW grill boiler (three heat)	10½×7×13	—	—	Suitable for 13 or 15 A outlet	Cream and black	£18 15 0
One 8in 1·8 kW (three heat or "Simmerstat" controlled)	10½×8 2·2 kW grill boiler (three heat)	6½×18¾×13¾	5×16×13½	300 W	—	Two-tone ivory or green and cream	£32 5 0
One 8in 1·8 kW one 6¼in 1 kW (three heat or "Simmerstat" controlled)	10½×8 2·2 kW grill boiler (three heat)	6½×18¾×13¾	5×16×13½	300 W	—	Two-tone ivory or green and cream	£33 5 0
One 8in 1·8 kW one 6¼in 1 kW (three heat or "Simmerstat" controlled)	10½×8 2·2 kW grill boiler (three heat)	6½×18¾×13¾	5×16×13½	300 W	—	Two-tone ivory or green and cream	£38 10 0
One 8in 1·8 kW (three heat or "Simmerstat" controlled)	10½×8 2·2 kW grill boiler (three heat)	5×17½×12½	—	—	—	Grey with white panels or two-tone ivory	£27 9 0

ELECTRIC COOKERS . . . . . *continued*

Manufacturer	Name or Model	Type	Size (H.W. & D. in inches)	Oven Type	Oven Size (H.W. & D. in inches)	Oven Loading	Type of Element	Oven Control
SIMPLEX ELECTRIC CO., LTD., Creda Works, Blythe Bridge, Staffs.	"Carefree"	Vertical	54½×21×25 (36in to top of hob)	Removable sides	15⅛×14×14½	2·5 kW	Tubular sheathed	Thermostatic
	"Super Comet"	Horizontal	50½×36½×25½ (36in to top of hob)	Removable sides and bottom	15×14½×16⅜	3·[illegible] kW	Tubular sheathed	Thermostatic
	EV.13	Vertical	43×21×19½ (36in to top of hob)	Removable sides	13⅜×13×13½	2·5 kW	Tubular sheathed	Thermostatic
	"Star" 305	Vertical, legs or plinth	43½×18½×24⅛ (36in to top of hob)	Removable sides	13¾×12⅝×14⅜	2·2 kW	Tubular sheathed	Thermostatic
	"Star" 310	Vertical, legs or plinth	45½×18⅜×24⅛ (36in to top of hob)	Removable sides	13¾×12⅝×14⅜	2·2 kW	Tubular sheathed	Thermostatic
TRICITY COOKERS, LTD., 109, Kingsway, London, W.C.2.	"Queen" 535	Vertical, plinth	52×22×22 (36in to top of hob)	Fixed	14⅞×15¾×14½	1·66 kW with 830 W booster	Tubular	Thermostatic (two stage)
	"Coronet" 550	Vertical	47×20⅜×21½ (36in to top of hob)	Removable	10½×11½×12½	1·15 kW	Spiral on ceramic former	Thermostatic
	528	Vertical	36×19¾×16	Removable	10½×11½×12½	1·15 kW	Spiral on ceramic former	Thermostatic

Electricity in Mines

IN his report for 1952, issued last week (H.M. Stationery Office, 2s), the Principal Electrical Inspector of Mines, Mr. J. Cowan, gives the horsepower of the 105,157 electric motors in use in collieries at 30th June of that year, for the purposes given in Table 1, as 3,326,539. The figures for 1951 were 97,183 and 3,184,630.

There were five fatal accidents from electric shock, including one at the surface, and also one from other causes; four involved electricians. There were also 65 non-fatal accidents (26 on the surface), in which 75 persons (including 33 electricians) were injured, and 24 dangerous occurrences. Of the fatalities four are ascribed to misuse, negligence or ignorance and two to faulty installation or maintenance in connection with switchgear and fuses (4), flexible cables and plugs (1) and armoured cables or accessories (1). The annual average for the ten years 1943-1952 was five fatal and 70·2 non-fatal accidents and dangerous occurrences. Non-fatal accidents due directly or indirectly to the use of electricity from 1950 to 1952 are classified in Table 2.

Attention is drawn to a death unconnected with electric shock which resulted from the fall (extending for 790 yd) of a 0·2 sq in power cable, weighing 25·5 lb/yd, from the centre of a roadway arch about 9ft from the ground. It is recommended that provision should always be made for suspended wire-armoured cables to have sufficient slack to allow for a short length to be lowered to the floor for roof repairs or for making joints after extraneous damage without disturbing the remainder of the cable. Old conveyor belting, often used as cable suspenders, must be strong enough for the job. Impregnated canvas suspenders are supplied by many manufacturers.

A screen-protected air-cooled resistance in a safety-lamp mine may be a hazard, even when installed further from the coal face than 300 yd. In one case coal dust on an overheated

TABLE I.—ELECTRIC MOTORS IN USE IN COAL MINES AT 30th JUNE, 1952

Surface			Underground		
Duty	No. of Motors	Horse-power	Duty	No. of Motors	Horse-power
Winding	838	257,479	Haulage	10,954	554,402
Ventilation	1,434	169,940	Pumping	11,433	522,555
Haulage	2,357	107,746	Air-compressing	1,025	47,305
Air-compressing	1,124	230,454	Coal-cutting	7,366	331,893
Coal-cleaning	14,522	298,963	Conveyors	16,947	384,058
Miscellaneous	21,296	337,075	Coal loaders	561	16,673
			Other portable machines ...	410	3,779
			Staple winders	58	7,744
			Auxiliary ventilation ...	2,782	24,446
			Miscellaneous...	1,180	12,763
			Stone loaders...	193	5,148
			Stone drilling machines ...	1,491	2,104
			Coal drilling machines ...	9,186	12,012
Totals	41,571	1,401,657	Totals	63,586	1,924,882

Oven Control	Hot Plates	Grill or Grill Boiler	Hot Cupboard or Grill Compartment (H.W. & D. in inches)	Storage Drawer (H.W. & D. in inches)	Storage Drawer Loading	Special Features	Finish	Price
Thermostatic	One 8in solid 2 kW ("Simmerstat" controlled) one 6½in solid (three heat)	10½×8 2 kW grill boiler	4½×17½×12½	7½×17×15½	400 W	Time clock, hob illumination	Cream and grey or white and grey	£50 0 0
Thermostatic	Two 8in radiant 2 kW each two 6in radiant 1 kW each ("Simmerstat" controlled)	Grill 1·5 kW	5½×13½×14½	6½×13½×16	400 W	Time clock, hob illumination, colour-glance controls and oven light	Cream or white	£122 10 0
Thermostatic	One 8in solid 1·8 kW one 6½in solid 1 kW (three heat)	2 kW solid grill boiler	4½×17½×12½	7½×16⅞×17	400 W	Glass door	Two-tone ivory or cream and green	£38 1 0
Thermostatic	One 8in solid 2 kW ("Simmerstat" controlled)	2 kW solid grill boiler	4⅜×11¾×17	—	—	Waist level switches	Two-tone ivory or grey and white	£27 0 0
Thermostatic	One 8in solid 2 kW ("Simmerstat" controlled) one 6½in solid 1 kW (three heat)	2 kW solid grill boiler	4⅜×11¾×17	—	—	Waist level switches	Two-tone ivory or grey and white	£29 4 0
Thermostatic (two stage)	One 8in radiant 1·7 kW one 6½in solid 1 kW (both "Simmerstat" controlled)	2·25 kW grill boiler ("Simmerstat" controlled)	8×14×16	—	—	Time switch control. Socket outlet "Simmerstat" controlled	Ivory or white. Choice of colours for handles and controls	£68 5 0 (auto-control panel) £54 12 0 (plain splashplate)
Thermostatic	One 8in solid 1·8 kW ("Simmerstat" controlled)	1·8 kW grill boiler	4¾×18×11¾	11½×19½×15	—	Time switch control. "Phoenix" ovenware provided	Ivory or white (10s 6d extra)	£34 13 0 (auto-control panel) £27 6 0 (plain splashplate)
Thermostatic	One 6½in solid 1 kW (three heat)	1·8 kW grill boiler	4×13×11½	16×19½×14½	—	Selector switch enables cooker to be used off 13/15 A plug	Cream or white (10s 6d extra)	£22 16 6

PRINCIPAL ELECTRICAL INSPECTOR'S REPORT

resistance grid was ignited. Only flameproof resistances of ample rating are really satisfactory for underground use. Ignition of firedamp, as the result of open sparking from a remote-control circuit (one of the earliest to be certified as intrinsically safe) at a defective contact of the earthing system, caused burns to two men using a drilling machine.

Reference is made to Safety Circular No. 148 of the Ministry of Fuel and Power pointing out that some circuits previously certified could ignite firedamp. Precautions included avoidance of interrupting remote control circuits at contacts exposed to the atmosphere; plug and socket couplings should be frequently examined. Many recent circuits, i.e., those having certificate numbers higher than T/RC/30, are available which have been subject to modern tests.

Two accidents showed the danger of ignition of detonators from a source of current such as a defective drill cable-coupler carrying the pilot control-circuit current. The Coal Mines (Explosives) Order, 1951, requires the shotfirer concerned to ensure that a cable used for firing shots cannot make contact with any other cable or electrical apparatus.

Regulations have been drawn up in other countries to eliminate the risk of contact between detonator wires connected to a source of current. In the United States, for

TABLE 2.—NUMBER OF PERSONS KILLED AND INJURED IN ELECTRICAL ACCIDENTS

Employment and Proximate Cause	Killed											Injured										
	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	Totals	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	Totals
Electric Shock and/or Arc Burns—																						
Surface workmen	1	1	2	—	—	—	—	—	—	—	4	3	3	3	6	9	4	7	5	8	6	54
Electricians	2	1	—	3	—	—	1	1	1	4	13	16	27	30	25	21	31	31	31	33	33	278
Coal-cutting machinemen	1	—	1	—	2	—	—	1	—	—	5	14	7	6	8	7	5	7	3	8	4	69
Machinery attendants	2	—	—	—	—	—	—	—	—	—	2	2	—	3	2	5	2	2	2	5	6	29
Other underground workmen	—	1	—	—	1	2	—	—	2	1	7	10	16	20	14	10	16	9	10	11	11	127
Totals	6	3	3	3	3	2	1	2	3	5	31	45	53	62	55	52	58	56	51	65	60	557
Ignition of Firedamp or Coal Dust	3	5	7	2	10	1	—	2	9	—	39	12	11	5	8	23	7	3	8	1	11	89
Fire	1	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	1	2	—	—	4
Other Causes	3	—	—	—	—	—	—	1	1	1	6	4	7	2	1	—	1	8	6	5	4	38
Totals, all causes	13	8	10	5	13	3	1	5	13	6	77	61	71	69	65	75	66	68	67	71	75	688

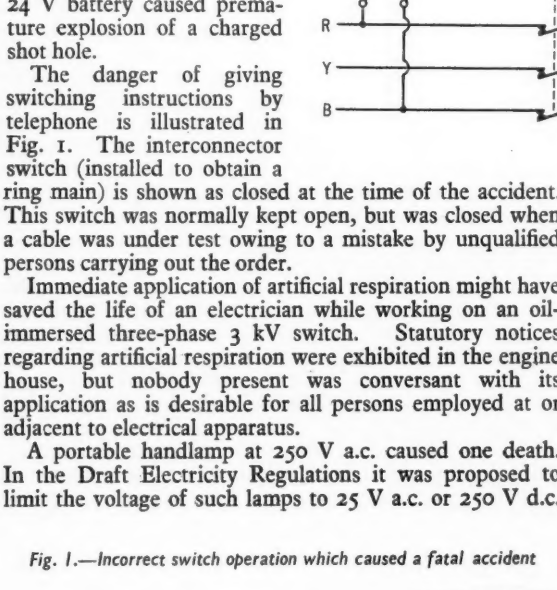
example, the leg wires of detonators are required to be kept shunted until ready to connect to the firing cable; blasting cables must be short-circuited at the battery end until ready to attach to the blasting unit and must be staggered as to length or have the ends well separated when attached to the detonator leg wires. Other authorities abroad require the use of insulator sleeves, to be removed only immediately before the detonator is connected to the shot firing cable. Mistaken use of a signal circuit supplied by a 24 V battery caused premature explosion of a charged shot hole.

The danger of giving switching instructions by telephone is illustrated in Fig. 1. The interconnector switch (installed to obtain a ring main) is shown as closed at the time of the accident. This switch was normally kept open, but was closed when a cable was under test owing to a mistake by unqualified persons carrying out the order.

Immediate application of artificial respiration might have saved the life of an electrician while working on an oil-immersed three-phase 3 kV switch. Statutory notices regarding artificial respiration were exhibited in the engine house, but nobody present was conversant with its application as is desirable for all persons employed at or adjacent to electrical apparatus.

A portable handlamp at 250 V a.c. caused one death. In the Draft Electricity Regulations it was proposed to limit the voltage of such lamps to 25 V a.c. or 250 V d.c.

Fig. 1.—Incorrect switch operation which caused a fatal accident



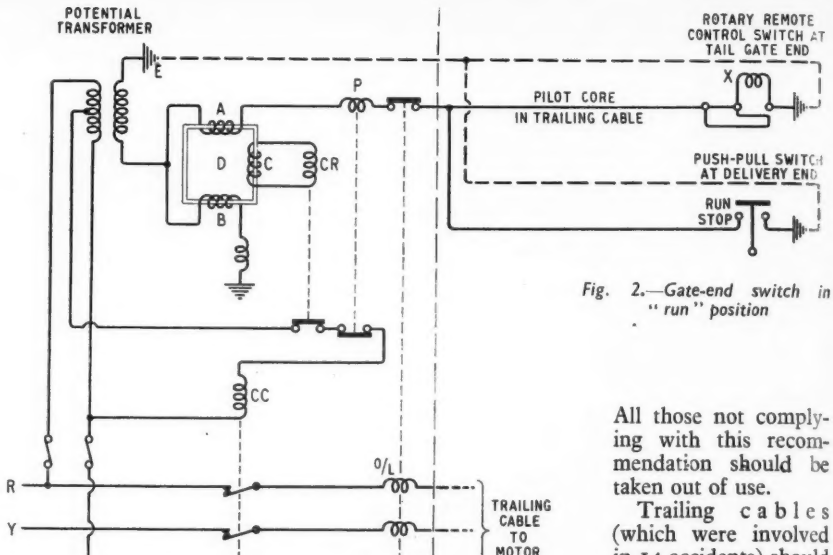


Fig. 2.—Gate-end switch in "run" position

All those not complying with this recommendation should be taken out of use.

Trailing cables (which were involved in 14 accidents) should not be dragged along by coal-cutting machines, and unauthorized re-setting and re-closing of switches after tripping on earth-leakage protection should be prevented; covers over re-setting mechanisms should be securely locked, special keys being kept only by electricians. Cable tests should be carried out systematically for the detection of deterioration. Five-core trailing cables should be used so that electrical plug interlock circuits can be utilized. The screening of these cables would have avoided many shocks and arc burns.

Serious injuries were caused in one case by the inadvertent re-starting of a conveyor during repairs. The gate-end switch was so connected (Fig. 2) that, with the rotary remote-control switch in the tail end in the "run" position, operation of the push-pull switch at the delivery end connected the pilot conductor to earth, thus short-circuiting the choke coil X. The unbalancing of the currents in the windings A and B of the balancing transformer D energized the relay CR, opening the contactor and stopping the conveyor. This arrangement, however, "fails to danger" in that, if faulty contacts develop at the push-pull switch in the "stop" position, the circuit becomes balanced, resulting in the re-starting of the conveyor.

Welding and Productivity

The second of the meetings on "Increasing Productivity by the Use of Welding" which the British Welding Research Association is arranging to be held at various centres throughout Great Britain is to take place in Bristol on Tuesday and Wednesday, 4th and 5th October, in the demonstration theatre of Electricity House, Colston Avenue, Bristol, 1, by kind permission of the South Western Electricity Board. The papers to be presented at the meeting are: "Recent developments in welding steel," by Mr. A. R. Muir, B.Sc.; "Welding medium carbon and low alloy steels," by Dr. C. L. M. Cottrell, M.Sc., A.I.M.; "Developments in non-destructive testing," by Mr. A. L. Carson, B.Sc., A.Inst.P.; "Processes for welding light alloys," by Mr. W. G. Hull, A.I.M.; "Metallurgical aspects of welding light alloys," by Mr. P. T. Houldcroft, B.Sc.; and "Resistance welding ferrous and non-ferrous metals."

Admission is by ticket which may be obtained free of charge from the Organizer, British Welding Research Association, 29, Park Crescent, London, W.1.

INDUSTRIAL NEWS

America Rejects British Offer

As we reported at the time, the English Electric Co. recently put in a lower tender than American concerns for six generators and three transformers for installation at the Chief Joseph dam on the Columbia River, in the State of Washington. The English Electric's price for the generators was $4,938,500 and the lowest American offer (that of the Westinghouse Electric) $5,837,050. For the transformers the English Electric's bid was $427,637 and the lowest American price, quoted by the Pennsylvania Transformer Co., was $497,578.

Now it is announced from Washington, D.C., that the Government has decided not to approve the acceptance of the English Electric's offer. So far as the generators are concerned it is said that the placing of the order with the Westinghouse Co., which is already to supply ten generators for the scheme, would prevent the aggravation of unemployment in the Pittsburgh area which is reported to be severe.

The following statement was issued from the Foreign Office on 28th August:—

"On the instruction of the Secretary of State for Foreign Affairs, Sir Harold Caccia, Deputy Under-Secretary of State, asked the U.S. Chargé d'Affaires to call at the Foreign Office on Saturday, to express the Secretary of State's grave concern at the rejection of the English Electric Co.'s bid to provide six generators and three transformers for the Chief Joseph hydro-electric power project although it was lower than any American tender, and to cause Mr. Dulles to be so informed."

Australian Steelworks Order

The General Electric Co., Ltd., has received from the Australian Iron & Steel Co., Ltd., a contract, valued at £165,000, for the complete electrical equipment for a two-stand temper mill for steel strip at Port Kembla, New South Wales. The mill will be similar in design to those now operating at the Trostre Works of the Steel Company of Wales, which were the first in Great Britain to operate at strip speeds of up to 4,000 ft/min.

Each stand will be driven by a 1,000 h.p. d.c. motor, and six motors totalling 2,100 h.p. are included for the auxiliary drives. G.E.C. control exciters operating in conjunction with a Ward-Leonard system will be used to provide the rapid response and complete stability which are essential features of a control scheme for high-speed mills of this type.

The contract is the latest of a series of orders placed with the G.E.C. for equipment for the Port Kembla works, which have included main and auxiliary mill motors, mercury arc rectifiers, switchboards and control gear.

Aircraft Lighting

Some of Britain's newest aircraft, among them the De Havilland "Sea Venom," the Avro "Vulcan" Mk. I bomber and the two-seater version of the Hawker "Hunter," are to use Thorn "Plasteck" console and instrument lighting. Contracts have been awarded to Thorn Electrical Industries, Ltd., to supply "Plasteck" for these aircraft and also for the Bristol "Britannia," the Gloucester "Javelin" trainer, the Vickers VT 1,000 and the Bristol 191 naval helicopter.

Diesel-Electric Loco Order

Brush Bagnall Traction, Ltd., Loughborough, has received a further order from the Steel Company of Wales for three Bo-Bo diesel-electric locomotives of 660 h.p. These locomotives are similar to three at present being supplied by the company to the Steel Company of Wales, except that the output of the Mirrlees diesel engine is to be increased by the fitting of a turbo charger and the complete weight of the locomotive will be increased to 90 tons compared with the 70 tons of the type now being supplied. The new locomotives will be of the same power and weight as the American locomotives now operating at the Port Talbot works of the Steel Company of Wales. The traction motors, control gear and main generators will be made by the Brush Electrical Engineering Co., Ltd., Loughborough; the six-cylinder, supercharged JS6 diesel engines by Mirrlees, Bickerton & Day, Ltd., Stockport; and the mechanical parts by W. G. Bagnall, Ltd., Stafford. The locomotives will be erected by Brush Bagnall Traction, Ltd., in their locomotive erecting shop at Loughborough.

Supply System in Burma

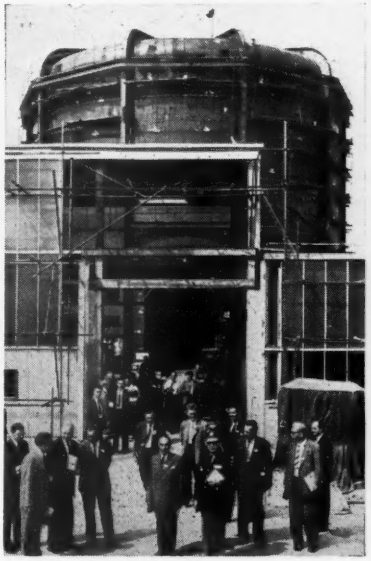
Mr. J. A. Hill, Electrical Inspector to the Government of Burma, says that there seems to be a misunderstanding among some manufacturers of electric motors that Burma has a variety of voltages and frequencies with the result that motors unsuitable for the supply are delivered. The system is 400 V three-phase 50 c/s for power and 230 V single-phase 50 c/s for lighting.

Cable Price Revision

The trade has been notified by the Rubber and Thermoplastic Cable Manufacturers' Association of revisions in the prices of rubber and thermoplastic insulated cables, wires and flexible cords as from last Monday, 29th August.

Arc Welding Merger

The Quasi-Arc Co., Ltd., and Fusarc, Ltd., are to combine their interests from 1st October next under the name of Quasi-Arc, Ltd. Both companies are subsidiaries of the British Oxygen Co., Ltd. The board of the new organization will be Mr. J. Strong (chairman), Dr. N. Cross (deputy managing director), Mr. R. Butler (sales director), Mr. N. F. J.



On Wednesday last week delegates to the Atomic Energy Conference, Geneva, visited the Harwell establishment of the U.K. Atomic Energy Authority. The left-hand picture shows a party at the "DIDO" heavy-water reactor now under construction and the other Sir John Cockcroft with Professor V. V. Vladimirsky (U.S.S.R.)

Reckitt (director and secretary), Mr. P. Shaw (director in charge of Gateshead works), Mr. H. C. Hebard (director in charge of Bilston works) and Mr. P. L. J. Leder (director, welding research). The head office will be at Bilston.

Factory Floor Heating

The new Dudley factory of Joseph Gillott & Sons, Ltd., the pen makers, is equipped with electric floor heating which will be operated during off-peak hours.

Electrical Commercial Travellers

It is now thirty years since the Electrical Trades' Commercial Travellers' Association was founded and the Committee has decided that the time has arrived when the office of president should be graced with a "collar and jewel" for use on special occasions. Mr. A. T. Haywood, who was vice-president of the Midland Branch from its inception until his election as national president last year, will receive the decoration at an investiture at a general meeting of the Association which will be held on Friday next week at the Feathers Hotel, Broadway, Westminster, London, S.W.1. The meeting will be preceded by a supper at 6.30 p.m. and the presentation of the collar at 7.30 p.m.; the general meeting is timed for 7.45 p.m.

Brush Australian Agreement

An agreement has been entered into by the Brush Group, Ltd., and Electric Control & Engineering, Ltd., of Sydney, Australia, by which Brush high voltage switchgear will be assembled and sold in Australia by Electric Control & Engineering, Ltd.

London Home Lighting Salons

New showrooms devoted exclusively to domestic lighting fittings were opened on 24th August by the Homeshade Co., Ltd., at 99, Baker Street, London, W.1, in which have been collected fittings by leading designers from all over Europe. The showrooms have been divided into two sections, one displaying traditional fittings (Spanish and Florentine), and the other fittings designed in contemporary style. The wide range of fittings include chandeliers, candelabra, table lamps, wall brackets and standard lamps each with their appropriate shades in a variety of materials, including metal, ceramics, wood and glass. Each fitting is wired for demonstration purposes.

A section of the new domestic lighting showrooms of the Homeshade Co.

Mr. J. Griew, chairman of the company, presided at the opening ceremony, which was performed by Mr. S. Travers of Selfridge's, and a brief speech was also made by Mr. J. Soneya, managing director. The showrooms are intended primarily for the use of departmental stores, architects and contractors.

Developments in Magnetic Materials

The Electronics Group of the Institute of Physics will be holding a symposium on "Some Recent Developments in Magnetic Materials" in the Institute's House, 47, Belgrave Square, London, S.W.1, on 23rd and 24th September. Seven papers will be read and discussed.

Hastings Tramways Celebrations

An open-topped six-wheel Guy trolley-bus which began its working life twenty-seven years ago is taking an active part in the fiftieth anniversary celebrations of the Hastings Tramways Co., which was formed in 1900. This vehicle is regularly carrying passengers on one of the routes as it has done since the system was converted to trolley-buses in 1928. Guys no longer make trolley-buses, but continuity of service with the Hastings undertaking is still maintained, for the majority of the vehicles now in service were made by the Sunbeam Trolley-bus Co., an associate of Guy Motors.

India Accepts Steelworks Proposal

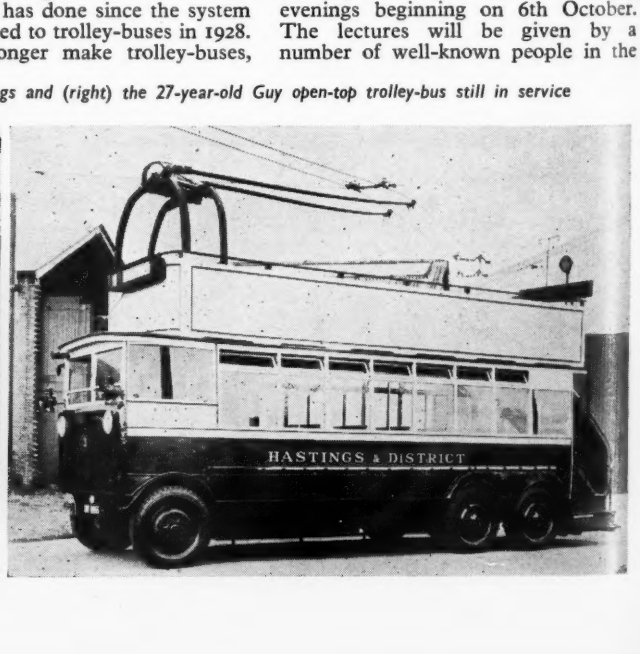
Last week the Government of India announced that it had accepted the proposal of a British consortium to build a steelworks in India with an annual output of a million tons a year and costing about £82 million. The principal products will be medium and light sections, rolling stock parts and pig iron. Plans for the new works are to be discussed with the consortium.

The Government has already agreed with Russian and German groups for the erection of steelworks. Its aim is to raise Indian production by six million tons a year.

Electric Traction Lectures

A course of twenty lectures on electric traction has been arranged by the Department of Electrical Engineering and Physics, Borough Polytechnic, London, S.E.1, on Thursday evenings beginning on 6th October. The lectures will be given by a number of well-known people in the

One of the modern Sunbeam trolley-buses at Hastings and (right) the 27-year-old Guy open-top trolley-bus still in service



electric traction world, including manufacturers and operators, and will cover electric railway, tramway and trolley-bus work, supply systems, etc.

Liverpool Productivity Exhibition

Electrical and electronic equipment designed to increase productivity in industry is shown at a Productivity Exhibition being held in St. George's Hall, Liverpool (25th August to 3rd September). The exhibition is sponsored by the Merseyside branch of the Institution of Works Managers with the co-operation of Liverpool City Council. Among the exhibitors are the Automatic Telephone & Electric Co., who demonstrate the assembly of contacts, insulators and spacers which compose the contact bank of an automatic telephone selector, and dial assembly. There is also an automatic machine for grading insulators for contact banks, a 25-line automatic exchange with special facilities, and a range of intercommunication telephones and staff locator equipment.

The Merseyside and North Wales Electricity Board exhibits an electronic induction heater, an electrode steam boiler, electronic control equipment, and switchgear and lighting equipment.

In connection with the exhibition the Merseyside Board held a luncheon at which the guest speaker was Mr. L. Landon Goodman, British Electrical Development Association. Mr. D. H. Kendon, chairman of the Board, also spoke.

Cathode-ray Tube Factory

Limited production of cathode-ray tubes for television and radar sets has started at the new factory of Mullard Blackburn Works, Ltd., now nearing completion at Simonstone, near Burnley, Lancs. The official opening ceremony will probably be held early next year when full production is reached. The new factory cost about £1,250,000 to build. There are 650 employees and there will ultimately be a labour force of 1,000 to 1,500.

Full-power V.H.F. Service

The B.B.C. announces that the v.h.f./f.m. sound broadcasting station at Wrotham, Kent, is now working on full power, the Home, Light and Third programmes each being transmitted with an effective radiated power of 120 kW.

Change of Name

The India Rubber, Gutta Percha & Telegraph Works Co., Ltd., is changing its name to Silvertown Rubber Co.

Smiths Flight System

Both British European Airways and British Overseas Airways Corporations have specified the Smiths flight system for their new aircraft. The system has been designed to provide a complete, rationalized installation for instrumental flight in large aircraft. It provides sixteen conventional instrument functions in only seven standard sized indicators, bringing manual and automatic control to a new level of safety and simplicity.

British European Airways, which was the first airline to order this equipment, will have it installed in its 26 Viscount "Major" (Type 802) aircraft. B.O.A.C. is employing the Smiths system in all the Britannia 300 and 300 L.R. series. A total of 20 aircraft are on order for the Corporation.

Thorn to Make T.V. Tubes

It was announced this week by Mr. D. G. Mitchell, president of Sylvania Electric Products, Inc. (United States), that in conjunction with his company Thorn Electrical Industries, Ltd., were to build a new works at Enfield for the production of cathode-ray tubes for television receivers. It was proposed to begin with 21in tubes which, Mr. Jules Thorn, chairman of Thorn Electrical Industries, considers will be the most popular size in future.

The factory is expected to cost about a million pounds and it will be financed equally by Thorn and Sylvania. It was emphasized that the activities would be outside the British Radio Valve Manufacturers' Association.

Trade Announcements

The address of **Toplis, Simpson & Co., Ltd.**, is now Maple Cross Industrial Estate, Denham Way, Rickmansworth, Herts (telephone: Rickmansworth 5369; telegrams: "Moymeter Rickmansworth").

G. S. Peckham & Co., Ltd., 3-5, New Compton Street, London, W.C.2, have been appointed distributors and stockists of the "Cozee Cumfort" electric blankets for the London area.

Albright & Wilson, Ltd., have signed an agreement with the General American Transportation Corporation who developed the Kanigen process of chemical nickel plating whereby they become the sole licensees for the United Kingdom, Eire and Denmark.

The address of the Cardiff branch of the **Hotpoint Electric Appliance Co., Ltd.**, now is 86-88, Adam Street, Cardiff (telephone: 32318).

"Automatic" Cooking

For use in electricity showrooms the Jackson Electric Stove Co., Ltd., 143, Sloan Street, London, S.W.1, has produced a display card (reproduced herewith) drawing attention to its "Cookalone" auto-control unit. It is 30in wide and 21in high with maroon lettering on a pale green background with dark green relief. A "Cookalone" unit, with connecting cable, is mounted in the centre of the card and there is a pocket containing leaflets.

Jackson "Cookalone" display card

NEXT WEEK'S EVENTS

Organizers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates do not clash with others already arranged

Thursday, 1st September, to Thursday, 15th September

LONDON.—Olympia. Engineering, Marine & Welding and Foundry Trades Exhibition.

Monday, 5th September, to Sunday, 11th September

FARNBOROUGH.—Society of British Aircraft Constructors. Flying display and exhibition.

Tuesday, 6th September

BIRMINGHAM.—James Watt Institute, Great Charles Street, 6.30 p.m. Institute of Metal Finishing, Midland Branch. Chairman's address by L. Mable.

HAMMERSMITH.—Windsor Castle Hotel, 134, King Street, 7.30 p.m. A.S.E.E. West London Branch. "Recent Developments in the Design and Application of Mercury Arc Rectifiers," by K. B. Blake.

Wednesday, 7th September

CARDIFF.—Royal Hotel. Institution of Works Managers, South Wales Group. Annual general meeting.

HARRINGAY.—Queen's Head, 677, Green Lanes, 7.45 p.m. A.S.E.E. North London Branch. "Digital Computors and their Applications," by J. Rice.

LEICESTER.—College of Art and Technology, The Newarkes, 6.30 p.m. Incorporated Plant Engineers, Leicester Branch. "Underwater Television."

PRESTON.—Chamber of Commerce, 49a, Fishergate, 7.30 p.m. A.S.E.E. Preston Branch. "Power Factor Improvement," by T. S. Smith.

Thursday, 8th September

CHESTER.—Incorporated Plant Engineers, Merseyside and North Wales Branch. "Atomic Energy," by J. A. Dixon.

GLASGOW.—425/427, Sauchiehall Street, 7 p.m. Incorporated Plant Engineers, Glasgow Branch. "Developments in Machine Tools," by J. R. Young.

Thursday, 8th September, to Monday, 12th September

HOLLAND.—I.E.E. Supply Section. Summer visit.

Friday, 9th September

BRISTOL.—Grand Hotel, 7.30 p.m. A.S.E.E. Bristol and West of England Branch. Business meeting and American electrical films.

NEW BOOKS

Protective Current Transformers and Circuits. By P. Mathews, B.A., A.M.I.E.E. Pp. 253; figs. 119; plates 4. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 36s.

It is not so long since the use of current transformers for the operation of protective relays was frequently regarded as an extension of their use for measurement purposes. And it was often assumed that they could be specified in much the same way except that the accuracy could be lower and that the over-current performance should be as good as space and cost would permit.

The publication of B.S. 2046 acknowledged the fact that protective transformers require quite separate consideration from the measurement transformers covered in B.S. 81, but apart from a few scattered monographs there has been no published theoretical work which could be regarded as a textbook on the subject. Mr. Mathews' book develops the theory of protective current transformers from the basic principles of coupled circuits without the use of ordinary transformer vector theory. The treatment of the subject is mathematical but the expressions developed by the author are accompanied by adequate explanation and graphical illustrations.

Starting with the simplifying assumption of a linear relationship between flux density and excitation, equivalent circuits and characteristics are deduced for current transformers with constant impedance and constant VA burdens. Current/quadrature voltage transformation and voltage summation are also considered on the linear basis. The theory is then extended to allow for the non-linear characteristic of ferromagnetic cores and also covers transformers with mixed core materials.

The principles of zonal protection and current summation methods are dealt with, including the principles of magnetic balance, self stabilizing systems and a number of other special applications. A chapter, devoted to general design considerations and testing, contains a section on the information required for design which should be of particular use to those who have to draw up specifications for protective current transformers.

Part Two of the book, which is contained in the same volume, deals with transient fault currents and the theory of transient current transformation. The same logical sequence is followed as in Part One but naturally the mathematics is more advanced and use is made of the Heaviside operator. The method of predicting the transient performance of c.t.'s is worked out in some detail with a numerical example for an actual design. The effect of this performance on high speed protection is discussed and also on current summation schemes.

The clear subdivision under headings will make the book useful for reference. A bibliography is given at the end of each chapter and a list of symbols is included. The book may well become a standard work on the subject, and will be of use not only to protection engineers, but to many who are concerned with the design and performance of current transformers.—J.A.C.

Electric Traction. By A. T. Dover. Pp. 441; figs. 325. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 60s.

Traction engineers have been eagerly awaiting this long promised new edition of Mr. Dover's famous book. Covering such a wide field, the earlier editions have been popular for many years. The new edition follows closely the pattern and form of its predecessors, and similarly, its strongest feature is that section dealing with train movement. The theory of the subject is most adequately dealt with in the book and all necessary formulæ are quoted, with derivations.

The bases of traction motor and control gear design theory are given in sufficient detail for the advanced student. The theory is followed by full descriptions, with illustrations, of the latest published designs of the various major manufacturers, British and foreign. Equipment intended for operation on high and low voltage d.c. and single and polyphase a.c. at low and industrial frequencies, is illustrated.

It is useful to find that details of road transport traction equipment are included. Although regarded by many as a dying form of transportation, it is always possible that there will be a revival, especially of the trolley-bus. Descriptions of rolling stock mechanical parts, trackwork, power transmission equipment and substations are given, together with several photographic illustrations of the equipment dealt with.

The inclusion of much of the work on polyphase a.c. electrification is of questionable value, and is hardly more than of historical interest. Much of this space could have been more usefully employed in dealing at greater length with thermal-electric traction equipment, which is inadequately covered when consideration is taken of the importance of the subject. Despite its being a third edition, some minor errors have crept into the text, such as the mention of 1,500 V d.c. railway electrification in the Birkenhead area.

This book, written mainly with the needs of the advanced student in view, will neither gain nor lose popularity from the new edition. It serves as an introduction to the subject and leads up to the study of the particular branches of electric traction, usually made when the student finally decides upon his future career.—R.N.

Electro-Technology. By M. G. Say, Ph.D., M.Sc., M.I.E.E. Pp. 167; figs. 113. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 10s 6d.

This book, although printed in rather small type, is easy to read on account of its clear layout, bold headings and many diagrams. A vast amount of fundamental information has been presented in a form which is readily accessible for reference. No words have been wasted but no essential details have been sacrificed to brevity. In some cases formulæ have been given without their derivation but the meanings of all symbols are made clear and marked on the appropriate diagrams.

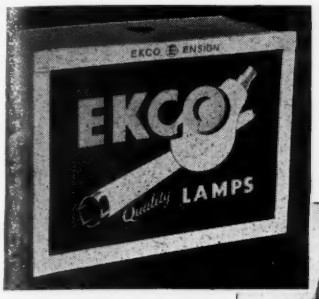
Part I of the book is a reproduction of the section by the same author in the "Electrical Engineer" reference book. It commences with a summary of modern electrical conceptions and fundamental physical relations. Units are dealt with in the next section where a table of comparison between the basic British, c.g.s. and M.K.S. units is given. General terms used in electrical technology are defined in accordance with B.S. 205: 1943 and the usual symbols given. Field phenomena and circuits are considered both for direct and alternating currents including the analysis of complex waveforms.

Part II has chapters on circuits and network calculations, symmetrical components, locus diagrams, and a short section on circuit and field analogies. Although the matter is condensed, the text is adequate and space has been found for a number of worked examples; these are particularly valuable in the chapter on network and circuit calculations where statements of the relevant theorems are followed by numerical examples illustrating their use. The solution of transient problems is dealt with in some detail and the method of their solution by ordinary and by operational mathematics is explained.

As a compact source of information at a reasonable price the book should be of considerable value to students and practising engineers although its value as a reference work would be enhanced by a more comprehensive index. A collection of mathematical tables and useful formulæ is given at the end of the volume.—J.A.C.

LAMP PUBLICITY

Material Available for the Coming Season



New Ekco-Ensign metal and glass sign

A Crompton counter sales-aid

WITH the continuance of one of the best summers we have enjoyed for years, the approach of the lighting season may seem a long way off, but lamp manufacturers have already prepared their campaigns and designed new publicity material in preparation for the winter months ahead. In the following notes we indicate some of the attractive dealer-aids which will be available.

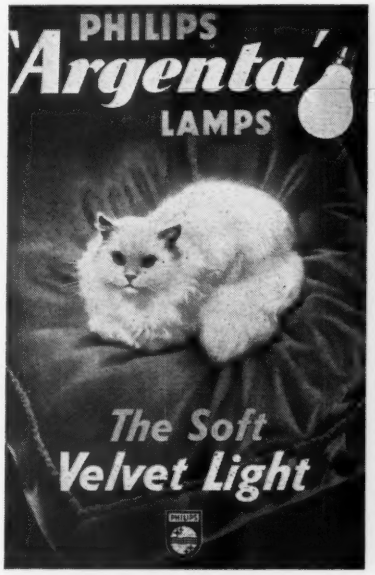
In addition to their usual extensive Press advertising, CROMPTON PARKINSON, LTD., are making use of commercial television by producing a series of cartoon filmlets with a humorous treatment. Transmission of these filmlets is due to start on the London weekday evening service as soon as the station opens this month, and a further series will be transmitted in due course in the Midlands service. Other point-of-sale material includes a cut-out showcard for window displays, price cards, a special lamp booster for the shop counter, a lamp dispenser unit and a reprint of last season's "mobile." The Crompton "flashing signs" which were so popular with stockists last season are being repeated this season, but with a new set of cartoons. There will also be an illustrated catalogue, a sales assistant's reference book, and other literature.

One of the most attractive of the sales-aids produced by EKCO-ENSIGN, LTD., is an illustrated metal and glass sign for indoor use, suitable for counter or window display. This measures 12in by 9½in by 5½in. A wide range of full-colour showcards, catalogues and leaflets are also available, and these will be supported by extensive trade and technical Press advertising. The company is shortly marketing a complete range of mercury and sodium discharge lamps and its range of tungsten filament lamps is being extended to include single and twin British prefocus headlamps.

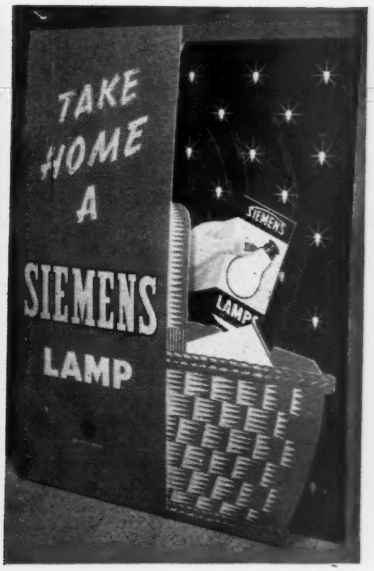
New dealer-aids being issued by SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., will include animated displays for counter and window use. One of these is the "Take Home a Siemens Lamp" display which shows a section of a shopping basket into which a hand repeatedly places a packaged lamp. This display is three-dimensional, in four colours and measures 18½in high by 16in wide. Other animated displays include "Siemens the Lively Lamp," printed in five colours and consisting of a stage and proscenium in three dimensions upon which a lamp character performs a lively jig. Both these displays are capable of continuous animation from a single dry cell battery, the life of which is from about eight to twelve weeks under these conditions. The display aid for plant irradiation lamps consists of a stout hardboard panel designed to accommodate the actual lamp in its carton. Advertising will continue in the trade and daily Press, and new revised catalogues will be available. There will be a wider distribution of the "Fleurite" contemporary lighting range and a range of domestic type wafer-heater convectors.

New sales-aids produced by PHILIPS ELECTRICAL, LTD., include a number of showcards, a new life-size girl cut-out and an infra-red display. The girl cut-out is 5ft 9in high, and shows the girl holding a lamp pack against a purple disc lettered in yellow and white. The showcards include a "lamp house" card incorporating holders for 40 W, 60 W, 100 W, and 150 W "Argenta" lamps, and another printed in natural colour with a yellow background, depicting two small children with a mother in the background and a blackboard bearing a sales message. There is also available a double-crown poster showing a white Persian cat on a cushion of red velvet. The background is in purple and the lettering is in white and Cambridge blue. The poster is suitable for use in the shop or in the window. The infra-red display consists of two wings swept back from the centre point. The illustrations of chicks and piglets are sloped back giving an impression of depth and

Philips double-crown poster



One of the Siemens animated signs



distance, and the animals are picked out in colours which give an effect of warmth and comfort radiating from the fittings shown on the bottom of the card. The display is 15in high by 24in wide by 6in deep.

The largest advertising campaign to be run by the GENERAL ELECTRIC CO., LTD., in the national Press will be the spearhead of its publicity campaign for "Osram" lamps in the new lighting season. Advertisements designed to appeal specially to the housewife will appear also in a wide selection of provincial papers and, including many in colour, in women's magazines. "Osram" fluorescent tubes will be advertised extensively in national newspapers and lamps for special purposes will be advertised continuously in technical journals. There will be a new poster on 3,300 outdoor sites throughout London and the Provinces, and mammoth signs on most of the main trunk roads. The "Osram" lamp in various guises will be the central feature of the new advertisements. It will appear as a housewife, as a mother pushing a pram, and even as a boy on a bicycle—all taking home "Osram" lamps.

New displays will be available to dealers. They comprise a special illuminated "Silverlight" display unit which demonstrates the glare-free shadow-free qualities of the lamp; an illuminated and animated window sign based on the new "housewife" poster; and a similar animated centrepiece for smaller shop windows which will be installed by the dealer service for periods of fourteen days. The "housewife" is also the subject of a colourful cut-out for window or counter display as an alternative to a new "birds in nest" cut-out in which an "Osram" lamp is portrayed as a mother bird telling her children—three lamps in a nest of raffia — to "rest content with 'Osram' light." The dealer service will also supply and fix on retailers' windows a gaily coloured translucent trapinex transfer. New window stickers will be available also to garages and other retailers of vehicle bulbs.

"Osram" "birds in nest" cut-out. The nest is of raffia

Supporting the advertising campaign, a plentiful supply of sales literature will be available for the new season, and all three parts of the "Osram" catalogue will appear in new editions. An up-to-date pocket price list with a new attractive cover will be issued on a larger scale than in previous years, enlarged in scope to include details of all lamps for general and special lighting purposes. For the general public there will be a four-page leaflet on the theme: "Light is cheap."

A series of weekly evening advertising "spots" has been booked for the BRITISH THOMSON-HOUSTON CO., LTD., on the London television programme for the peak viewing period each Saturday night. Sonya Raven will demonstrate a simple method worked out by "Mazda" lighting experts to help the ordinary viewer get the best from each light bulb or fluorescent lamp bought for the home. The campaign will be backed by a folder distributed to retailers.

The company's "Queen of Light" competition has this year been extended to cover ten additional areas; the finals will take place in London at the Lyceum on 12th December. Advertisements will appear throughout the competition in the national, provincial and trade Press. A variety of display material is available to retailers. Brand-name reminders will continue to appear in all the main national daily and provincial newspapers and the London evening Press. These will be backed by extensive prestige and product advertising campaigns in some 200 trade and technical journals. A wide range of point-of-sale material will be available, including new "lighting to measure" display pieces and a novel display container for Group II bulbs and miniature lamps. Publicity material will be mailed direct to over 24,000 re-sellers during the coming year.

One of the new Mazda silk screened illuminated "lighting to measure" displays

Geophysical Year Programme

The Royal Society recently announced its programme for the International Geophysical Year—July, 1957, to December, 1958. Over forty scientific research stations in the United Kingdom, over thirty stations in the Colonies and seven research vessels at sea will contribute to this country's programme. Scientists at these British stations are now making preparations to observe a great variety of natural phenomena. Their observations will be synchronized with others to be made in 35 other countries in accordance with a prearranged calendar of "Regular World Days." Some of these stations will measure continuously the amount of radiation from the sun received on the earth's surface, and by using a special instrument designed by Professor G. M. B. Dobson of Oxford University the amount of ozone in the earth's atmosphere will be measured. The ozone layer cuts off some of the sun's radiation and it will be valuable to know more about it.

Variation of the earth's magnetic field, especially the sudden disturbances at times of solar flares, sunspots and eclipses can throw light on the mechanism connecting the sun's radiation and the earth's magnetism. As part of the world network of geomagnetic stations observations will be made at Lerwick, Shetland Islands, Eskdalemuir in Southern Scotland, at the Hartland and Abinger stations of the Royal Observatory, Greenwich, and in the Falkland Island Dependencies, as well as at a station on the Antarctic continental land mass.

Simultaneously with magnetic disturbances there often appear the polar aurora. The appearance of the *aurora borealis* or northern lights will be recorded not only by a team of observers but also by a number of photographic and radar instruments. The United Kingdom work will be centred on Scotland where Mr. J. Paton, Reader in Meteorology at Edinburgh University, will co-ordinate results from a large sector of the European observations.

Transmission in Cyprus

FIRST STAGE OF SCHEME COMPLETED

IN 1946 the Government of Cyprus embarked upon a ten-year, £10 million programme of development, which embraced an island-wide electrification scheme the first stage of which is estimated to have cost £2·5 million.

Electricity supply on the island was previously confined to a few municipalities and to private generating plant, totalling about 10,000 kW, owned and operated by mining companies and other organizations. The new scheme, when completed, will include a 70 MW generating station at Dhekelia, in the south-east of the island, together with a comprehensive distribution system.

The first stage of the scheme included the building of the first part of the power station—with 28 MW of installed plant—and the erection of 66 kV and 11 kV transmission lines to provide supplies to most of the principal towns and to the main mining and industrial areas.

The three turbo-alternator sets—two each of 7 MW and one of 14 MW—generate at 11 kV three-phase 50 c/s. The output from each set is taken by seven single core 0·40 sq in cables to the main 11 kV switchroom. The cables from the two smaller sets are about 165 yd long, of which 120 yd is laid direct, the remainder being in ducts or cleats, while the cables from the 14 MW set are 135 yd long and are laid through a cable tunnel connecting the main station building to the switchroom basement. The output of a 750 kW 415 V diesel-alternator house service set is fed to the auxiliary station switchboard by ten single-core 0·40 sq in low-voltage cables. The station auxiliaries operate from a 415 V system at present consisting of two sections of switchgear which will be extended to four sections. Each section is supplied from a 1,000 kVA 11 kV/415 V transformer, and each transformer is connected to the 11 kV switchboard by a three-core 0·20 sq in lead-sheathed and wire-armoured cable and to the low-voltage switchboard by ten single-core 0·40 sq in cables routed along the cable tunnel.

The outgoing power from the main 11 kV switchboard is fed to each of the two 15 MVA line transformers by six single-core 0·40 sq in cables. The 11/66 kV transformers and their switchgear are of the outdoor type, and are situated in a switching compound. All single-core cables are laid in trefoil formation, and all lead sheaths are bonded to the station earth at each termination. These cables have a plain lead finish where they are cleated, but have a served finish where they are laid direct. All multi-core cables are steel wire armoured.

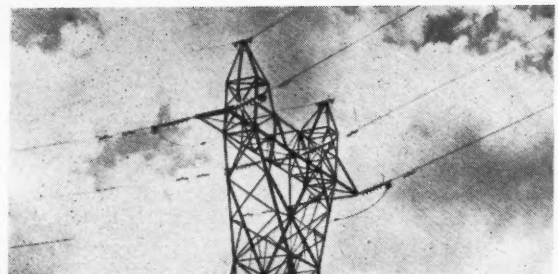
British Insulated & Callender's Construction Co., Ltd., were responsible for the 66 kV and 11 kV transmission lines. Although these lines are mainly on the plains, one section crosses the Troödos range of mountains, reaching a height of 4,000ft, and one line passes only 400ft lower

In due course Cyprus will have a very comprehensive power distribution network

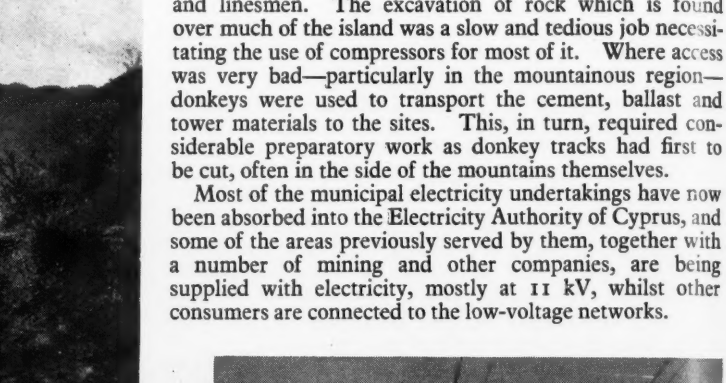
than the summit of Mount Olympus (6,406ft). Construction work was started in 1951 and the company's staff, working in a supervisory capacity under the direction of the Electricity Authority of Cyprus, have been responsible for the erection of 161 miles of 66 kV and 57 miles of 11 kV lines.

From the switching compound at Dhekelia power station there are three single-circuit 66 kV lines two of which form the central ring via Nicosia, Astromeritis, Peristeronari, Karvounas, Trimiklini, Limassol, Mari and Larnaca, while the third circuit is to Famagusta. Provision has been made for the duplication of the existing Dhekelia-Nicosia and Dhekelia-Limassol circuits and for an eastern ring extending from Famagusta via Lefkoniko to Nicosia.

The Dhekelia power station



66 kV steel tower on 1,500ft span in mountainous area



An 11 kV angle wood pole on single-circuit line between Kyrenia and Nicosia and (right) a 66 kV double wood pole line road crossing between Nicosia and Astromeritis

The 66 kV lines consist of 7/0·161in steel-cored aluminium conductors in horizontal formation at 13ft spacing. The conductors, and two overhead galvanized steel earth wires, are carried on twin wood poles 44ft high with steel cross arms, except for a three-mile stretch over War Department property near Dhekelia (where steel towers were used to give greater ground clearance) and a 23-mile stretch in mountainous country where towers were necessary owing to the rigorous weather conditions, also a short section between Karvounas and Limassol where it was found that the route required longer spans than those afforded by wood poles.

Switching and transforming stations are provided at various points on the 66 kV ring main, and section switches are installed at Trimiklini, Karvounas and Peristeronari to isolate that section of the line which is in mountainous country and liable to damage through severe weather conditions. There are switching stations at Nicosia and Limassol, and transforming stations at Mari, Trimiklini, Karvounas, Peristeronari, and Astromeritis. A transforming station is also provided at Famagusta, on the third circuit; this can be converted to a switching station if required during completion of the later stages of the scheme.

The distribution of electrical energy is by 11 kV overhead lines from the switching and transforming stations, with the three copper conductors carried on wood poles, in horizontal formation, without earth wires. In the mountainous region the 14 miles of line have been designed for snow loading, with the conductors in triangular formation and the addition of two earth wires.

Difficult Terrain

Although very few Cypriot workmen had previous experience of erecting overhead lines, they were quick to learn and were soon trained to a reasonably high standard of efficiency under the guidance of the B.I.C. engineers and linesmen. The excavation of rock which is found over much of the island was a slow and tedious job necessitating the use of compressors for most of it. Where access was very bad—particularly in the mountainous region—donkeys were used to transport the cement, ballast and tower materials to the sites. This, in turn, required considerable preparatory work as donkey tracks had first to be cut, often in the side of the mountains themselves.

Most of the municipal electricity undertakings have now been absorbed into the Electricity Authority of Cyprus, and some of the areas previously served by them, together with a number of mining and other companies, are being supplied with electricity, mostly at 11 kV, whilst other consumers are connected to the low-voltage networks.

Messrs. Preece, Cardew & Rider are the consulting engineers for the scheme while Messrs. Scott & Wilson, Kirkpatrick & Partners carried out the civil engineering work.

Conference on Steelworks Cranes

A conference on electric overhead travelling cranes organized by the Plant Engineering Division of the British Iron and Steel Research Association will be held at the Hotel Majestic, Harrogate, on 5th and 6th October, under the chairmanship of Mr. W. F. Cartwright, D.L., J.P., M.I.Mech.E., assistant managing director and general manager (Steel Division) of the Steel Company of Wales, Ltd. Papers on steelworks requirements for cranes; manufacturers' views; structural design; mechanical features—bearings, couplings, rail wheels, etc.; crane cab layout and design of controllers; electrical equipment and safety aspects of crane design, operation and maintenance, will be presented.

Tropical Air Conditioning

MODERN METHODS SURVEYED

By K. G. BELL*

IT is unfortunate for many that it is so very much more expensive to cool an area than it is to heat it. While one can obtain a good 1½ kW electric fire for £5 or so, a 1½ kW a.c. air conditioner in many areas of the tropics costs about £250 and a d.c. machine of the same capacity may cost as much as £400. These exorbitant figures would, it might be expected, deter all but the wealthiest from acquiring an air conditioner, yet in spite of the high initial costs and the by no means negligible running costs, the air conditioning industry in most parts of the Tropics is a flourishing one. In India, for instance, a large proportion of executives, both European and Indian, in the major cities of Bombay and Calcutta have air conditioned offices and most European homes have at least one bedroom air conditioned by a so-called "portable" unit. Air conditioning in many parts of the world is thus rapidly becoming to many a necessity rather than a luxury.

In the Orient most bedrooms have a cubic capacity several times greater than that of their European counterparts. Ceilings are often 17 to 25ft in height so that the cooling of these large rooms poses a difficult problem. Provision of a false ceiling at a height of about 11ft above floor level in the average bedroom costs in the neighbourhood of £75 to £100 and even with such a ceiling fitted, it is usually found that the standard so-called ¾-ton machine is inadequate for the job. (For some reason or other air conditioning capacity is rated in tons; when a machine is referred to as having a capacity of one ton it means that it is theoretically capable of providing the same cooling effect in a day as the melting of one ton of ice in that period.)

In the United States, it was found that machines with a capacity of ¾ ton were quite adequate for most bedrooms in most districts so that this size was more or less standardized with the result that thousands of such units were exported to the Orient where they were installed in rooms whose capacity was far too great for them to operate efficiently. It cannot be too strongly emphasized that for any who are considering entering the Oriental market, it is a waste of time and money to attempt to sell a machine with a capacity of less than one ton.

In spite of repeated warnings by the manufacturers' agents, the public for a long time endeavoured to air condition bedrooms and sometimes sitting rooms by means of an installation consisting solely of one of these small ¾-ton units. Many users were surprised and annoyed to find that in the high summer of most tropical cities, the temperature of their bedrooms did not fall at all; in fact, in the relatively dry period before the monsoon when the evening temperature falls quite rapidly, it was frequently found that the temperature inside the air conditioned bedroom at, say, 8 o'clock in the evening was greater than that immediately outside it.

The only relief which many of these machines could offer was during the monsoon period when the humidity is very high indeed. During this season these small machines could provide a measure of dehumidification. Fortunately, users are at last beginning to realize that the ¾-ton machine is unsuitable for the job which has too often been given to it in the Tropics and more and more people are now buying larger machines which are capable of reducing the temperature and humidity to comfort level.

It has been found by experience that to exist in comfort without an electric fan the dry bulb temperature must not exceed 78 deg at about 60 to 65 per cent relative humidity. In May and June in the Tropics to provide even a moderately-sized room with the above conditions is no mean task and a unit with a capacity of at least 1½ tons is usually required. This is understandable when one remembers that in cities like Delhi there are nearly always two or three days in June when the *minimum* dry bulb temperature exceeds 90 deg and when the maximum often exceeds 112 deg in the shade. Although the temperatures in the coastal cities are not so terrifying, the humidity in the summer months makes life extremely uncomfortable.

The latest type of portable air conditioners, which are almost universally of the "window" pattern, are certainly better equipped to tackle such conditions but the limitations of the portable units will nevertheless result in their use being limited to largely domestic applications. As the years go by, however, more and more flats will appear which will be entirely air conditioned throughout by large central plants. The use of a large plant enables a whole flat to be properly air conditioned at a cost not much greater than that of operating a 1½-ton portable machine throughout the day and night in one bedroom. To give some idea of the consumption of all-electric air conditioned flats in the Orient, it may be mentioned that a block of 36 such flats recently erected in Calcutta consumes no less than a million kWh a year.

Commercial and Industrial

One of the undesirable features of small air conditioning units is the relatively high cost of maintenance. This arises from the employment of two, and sometimes three, small motors in the machine. Frequently, these small motors are expected to operate under most unfavourable conditions and the very small blower-fan motor, which has a capacity frequently as small as 1/40 h.p., is a constant source of trouble. Before the war, in spite of this, there were very few large buildings air conditioned by central plants and even after the war it was some time before a start was made in this direction because of the non-availability of large compressors and their accessories. Now, however, all this has changed and to-day no new office block is ever likely to arise in most of the major cities of the Orient without consideration being given to the question of a central air conditioning plant.

There are several different types of plant to choose from. The orthodox installation consists of cooling and dehumidification arrived at by the forcing of air at high pressure over evaporator coils, the temperature of which has been reduced by the expansion of the refrigerant. The cooled, dehumidified and filtered air is then distributed by means

* Commercial Engineer, Calcutta Electric Supply Corporation, Ltd.

of insulated metal ducts to the area required. This system has the advantage of simplicity but, because of the size and length of the ducts required to transport the conditioned air, the appearance of the building concerned is not enhanced and the cost is still substantial.

To overcome the duct difficulty, chilled water is now commonly employed. In this case, the refrigerant cools a chiller which in turn cools water to a predetermined temperature and this is then distributed throughout the building. Sometimes the insulated chilled water pipes are introduced directly into the rooms to be cooled; in other installations the chilled water is brought to points adjacent to the rooms to be cooled and air cooled by the chilled water is then distributed by means of short overhead ducts fed from high velocity fans which are situated behind the chilled water coils.

Storage System

A further advance is the storage system. In this case, a tank is constructed and designed to hold an adequate amount of chilled water or brine. Since air conditioning in office blocks is usually only needed for about nine hours a day, by using a storage tank or reservoir it is possible to reduce the amount of compressing plant required and operate this up to twenty-four hours a day if desired. An additional advantage of this system is the higher load factor of the plant which usually enables a substantial saving to be made in operating costs, since nearly all supply authorities offer some inducement to consumers with large air conditioning installations to increase their load factors.

There is no doubt at all but that this type of installation is the plant of the future. At present, the capital cost of the reservoir and pumps is such that a capital saving is unlikely to be made with plants with a capacity of less than 50 tons but nowadays nearly all office blocks and most industrial applications require a plant of much greater capacity than this.

It will readily be appreciated that where the whole of an office block is supplied on a load-factor tariff by the supply authority, it will often be possible to balance the day load of lights, pumps, industrial cookers, etc., by an almost equal night air conditioning load, thus enabling very high monthly load factors to be achieved. When it is realized that a modern office block with a 300-ton air conditioning plant may consume half a million kWh a year, a reduction in unit charge which may amount to as much as 33 per cent is a real inducement.

Until the advent of this type of plant, supply authorities looked with disfavour on office air conditioning schemes, but now that these can make a tangible contribution to filling up their night " valleys " a very different reception is accorded to them. It is to be hoped that the manufacturers of large refrigeration units in the United Kingdom will not overlook the advantages of this system in their attacks on overseas markets.

British Exhibition, Copenhagen

King Frederik IX of Denmark will open the British Exhibition on 29th September in the Town Hall of Copenhagen. Mr. P. Thorneycroft, President of the Board of Trade, will represent the Government at the ceremony. On 12th October the Duke of Edinburgh will arrive in Copenhagen in the Royal Yacht *Britannia* and will visit the exhibition in the course of the two following days. Mr. A. R. W. Low, Minister of State, Board of Trade, will be present at the same time.

The exhibition, which will continue until 16th October, is exclusively British. More than 600 British companies are taking part, showing a representative range of products from heavy engineering and motor vehicles to textiles and fancy goods. Associated with the exhibition there will be a series of special events which will put Copenhagen *en fête* by " bringing Britain to Scandinavia " for the whole two-and-a-half weeks.

At a Press conference Sir Norman Kipping, director-general of the Federation of British Industries, said that the purpose of the exhibition was to give a boost to British exports in the Scandinavian countries, which were traditionally good customers but where fierce competition, especially from Western Germany, was now being felt. Together the four Scandinavian countries, Denmark, Finland, Norway and Sweden, represented our second best export market in the world, only Australia being ahead. Of the four countries, Sweden was our largest single market in Europe after Holland; and Norway and Denmark had the largest per capita consumption of British goods in Europe. On the other side of the picture, Britain took more of Denmark's, Sweden's and Norway's exports than any other country. But whilst we remained the top exporter to Denmark, Finland and Norway, we had in the last few years lost ground to Western Germany in the Swedish market. It was a vital interest of this country to maintain and if possible improve our position in the Scandinavian countries.

The exhibition is sponsored jointly by the Federation of British Industries and the British Import Union of Copenhagen, and its organization has been entrusted to the F.B.I.'s subsidiary company, British Overseas Fairs, Ltd. The exhibits, occupying over 115,000 sq ft of net stand space, are divided between two sites, the Forum and the Tivoli Gardens. The Forum, which in the main will house engineering products, is Copenhagen's permanent exhibition hall. It is being largely rebuilt and considerably enlarged in order to house the British Exhibition. In addition, two British prefabricated buildings are being added to it and are now nearly complete. The Tivoli Gardens will be devoted mainly to consumer goods.

The principal groups of products shown will include general engineering, electrical engineering, electrical goods and appliances, domestic equipment, machine tools, plastics, scientific instruments and radio.

In addition to the stands of individual British manufacturers or their agents there will be composite displays by the Scientific Instrument Manufacturers' Association and the Radio and Electronic Component Manufacturers' Federation (in the Forum). The Board of Trade stand in the Forum will include a feature arranged by the Council of Industrial Design, " British Design—Past, Present and Future." Another stand in the Forum will be occupied by the United Kingdom Atomic Energy Authority.

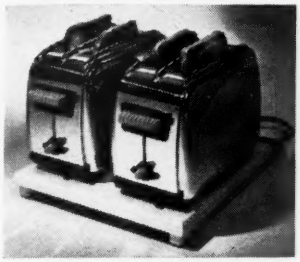
EDUCATIONAL

We have received from the Manchester and District Advisory Council for Further Education (Education Offices, Deansgate, Manchester, 3) a booklet setting out courses in specialized branches of engineering at the Manchester College of Technology and the Royal Technical College, Salford, during the 1955-56 session. They include courses on steam turbines, fuel efficiency, mining electrical equipment, aircraft electrical equipment, railway signalling, work study, cooling towers, linear network synthesis, power system protective gear and colour television. The booklet also gives brief synopses of normal post advanced courses in engineering at various Lancashire technical colleges.

NEW ELECTRICAL EQUIPMENT

Automatic Toasters

A new range of automatic electric toasters especially developed for the catering trade is now available from



Bank of "Elga" toasters suitable for four slices

ELGA PRODUCTS, LTD., Elga Works, Railway Place, Wimbledon, S.W.19. They consist of independent two-slice units and a user can build up a larger bank of toasters when increased trade warrants this. Should one toaster require maintenance the remainder can stay in use, thus providing an uninterrupted service.

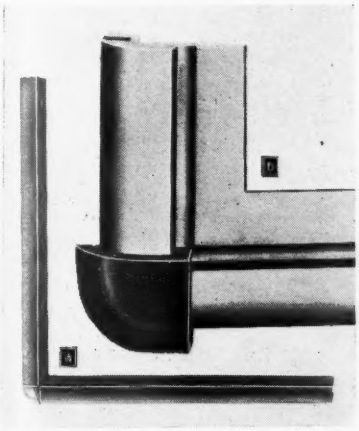
Operation is fully automatic and no pre-heating is necessary. A colour dial allows infinite variation from very light to dark brown. Two to eight-slice models are standard but larger banks can be built up to customers' requirements.

Cabinet Construction System

A new "make-it-yourself" cabinet construction system is being marketed by ALFRED IMHOF, LTD., 112-116, New Oxford Street, London, W.C.1. It is known as the Imhof-Elliott system and Imhofs are the sole distributors.

Fundamentally, the system consists of two different units, each interlocking one with another. These are the corner-connector, which governs the shape of the projected case or framework, and the alloy extrusion frame-member which may be cut to any size within the standard 12ft length. The triple-pronged corner-connector corresponds in section with that of the frame-member and the two units interlock. Allowance is made for screw tapping or similar fixing, and the rebated edge seen on the frame-member provides for a clean flush fitting of panels of any suitable or preferred material. This system of construction is considered to be particularly useful where prototypes are required quickly.

At the present time the angle of corner-connector in production is the standard 90 deg. Imhofs hope to announce soon the production of a range of angles, so that it will be possible to produce virtually any rectilinear shape.



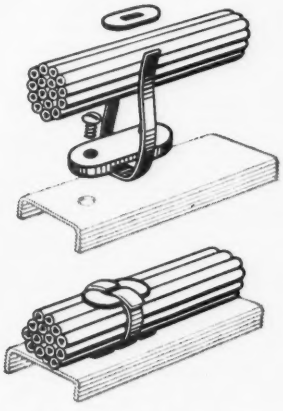
Imhof-Elliott cabinet construction: (a) Part of a frame (b) A corner fitting

Cable Fixing

What is claimed to be a new method of securing auxiliary wiring in switch panels and cubicles is now being manufactured by CRITCHLEY BROTHERS, LTD., Brimscombe, Stroud, Glos. Known as the "Beta" system, it consists of a p.v.c. covered flexible aluminium strip, which is secured to the frame of the equipment by a moulded saddle, and clipped tightly on to the bunched wires by a plastic buckle. The method of fixing can be seen from the illustration.

The strip is supplied in 50 yd rolls and is cut to length on site, and the saddles and buckles are supplied separately in boxes of 100. A standard 4 BA or No. 6 self-tapping screw is used to fix the saddle, the head being recessed and clear of the cables. Any reasonable number of cables can be secured in this manner and it is an easy matter to add or remove one or more cables if the circuit is modified at any time. All the components are fully insulated, except the recessed screw, and the system can safely be used with any type of cable insulation.

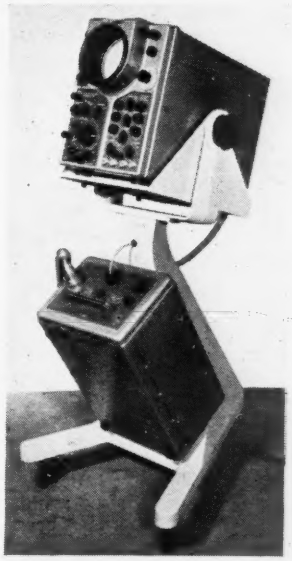
A particular advantage of the "Beta" system is that the strip will not stretch in use and so allow the cables to become loose.



Method of using Critchley Bros.' "Beta" cable fixing system

Two-Channel Oscilloscope

Three new two-channel cathode ray oscilloscopes have been introduced by NAGARD, LTD., of 18, Avenue Road, Belmont, Surrey. The DE103 covers a wide band from d.c. to 10 Mc/s with identical amplifiers in each of two channels, driving a 6in c.r.t. with two separate gun systems, ensuring no interaction. This is an ideal instrument for monitoring the input and output waveforms of a wide variety of electronic equipment.



Nagard DT103 oscilloscope mounted on a trolley

The DT103 is a high sensitivity, low frequency oscilloscope covering the range from d.c. to 100 Mc/s in two identical channels. The sensitivity is 1 cm/250 μV and the noise level of the order of 10 μV. A wider range time base with versatile triggering circuitry, sweep expansion on either one or both beams and independent X shifts help make this a useful instrument for strain gauges and electro-physical work.

The model DS103 is a less sensitive version of the DT103. The range covered is d.c. to 250 kc/s and the sensitivity is 1 cm/8 mV. All three instruments can be mounted on a trolley as illustrated.

Financial Section

STOCKS and SHARES

ERRATIC conditions followed the slump which suddenly beset all sections of the industrial markets of the Stock Exchange during the greater part of August. Instability has been marked in recent favourites such as the shares associated with the future of the atomic power projects. A.E.I. shares, for instance, fell in the space of a month from 96s 6d to 83s 6d, subsequently recovering half the loss in returning to 90s. Many other industrials followed a similar course, so that the share price indices fell at one time to a point some 14 per cent below the all-time peak recorded in July, and not much more than 5 per cent above the average at the beginning of the year. Gilt-edged stocks have touched their lowest quotations for many years.

"Credit Squeeze"

Stock Exchange members are generally agreed that the sometimes dramatic extent of recent swings in industrial share prices is much out of proportion to the amount of business transacted. Selling is reported to have been steady rather than heavy, and to have produced exaggerated effects in markets largely deprived of buyers by holiday conditions and by the disposition of investors to avoid new commitments until more has been seen of the effectiveness of the Chancellor's intensified "credit squeeze." The latter, incorporating as it does the pressure on bank overdrafts, is thought already to have been responsible for much of the past month's liquidation of securities, and is likely to continue to have some influence in coming weeks.

Irregular Movements

Many price changes of up to half-a-crown or more in either direction reflect, in this week's tables, the unsettled state of industrial market affairs. Coupled with the fact, mentioned above, that activity has been too low to invest changes with much significance, this makes it difficult to detect any distinct trend one way or the other. It can be said that at the beginning of this week confidence seemed to have reached a stage of convalescence. In the gilt-edged market, prices remained depressed by the prospect of high interest rates for some time to come, although they were helped a little by cautious hopes of an improvement in the gold reserves figure for August. The new British Electricity 4½ per cent stock hovered around its issued price of 98.

Pye Report

The appearance of Pye's full report within a day or two of the opening of the Radio Show, lent special interest to the accounts. It also gave point to lines in the chairman's review to the effect that if the company made no more profits at all from selling radio and television sets there would still be

The Week's Price Changes

Company or Board	Nom. Value	Middle price 29th Aug.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1955 Highest	1955 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	78½x.d.		3	3	3 16 6	94⅜	78½
Brit. Elec. 1974/77	100	76½	−1	3	3	3 18 6	93⅞	76½
Brit. Elec. 1976/79	100	83½		3½	3½	4 3 10	98⅜	83
Brit. Elec. 1974/79	100	92½x.d.	−1	4¼	4¼	4 12 0	109	92½
Overseas Electric Supply								
Calcutta Elec.	£1	22/-		6†	6†	5 9 0	22/6	20/9
East African Power	£1	22/6	−6d	7	7	6 4 6	24/6	19/9
Nigerian Elec.	£1	23/6		10	10	8 10 3	27/-	22/6
Palestine Elec. "A"	£1	21/-		Nil	Nil	—	22/9	21/-
Perak Hydro-Elec.	£1	20/-		6	10	10 0 0	21/6	17/9
Equipment and Manufacturing								
Aberdare Cables	5/-	12/-	−3d	12½	17½	—	14/6	11/-
Aerialite	1/-	6/3	−3d	88⅛	88⅛	—	6/7	5/3
Allen, W. H.	£1	77/6		20	20	5 3 3	83/9	77/-
Aron Elec. Ord.	£1	57/6	+2/6	15	15	5 4 3	63/9	55/6
Assoc. Elec. Ord.	£1	90/-	+2/6	11½	14	3 2 3	96/-	65/3
Automatic Tel. & El.	£1	70/-		15	15*	4 5 9	79/6	69/-
Babcock & Wilcox	£1	85/-	+2/6	12*	15	3 10 6	98/-	68/6
Baldwin, H. J.	2/-	5/-		20	20	8 0 0	5/6	4/4
Bakelite	10/-	33/-	−1/-	12½	16	4 17 0	34/6	27/-
British Aluminium	£1	50/-		10	12	4 16 0	58/-	35/3
B.I. Callender's	£1	47/6	+1/6	10	10	4 4 3	55/3	44/9
B.I. Callender's 6% Pref. ...	£1	23/-		6	6	5 4 4	26/6	23/-
British Thermostat	5/-	32/6		27½	27½	4 4 7	35/-	22/6
British Vac. Cleaner	5/-	7/6	−6d	25	30	—	10/-	7/-
Brook Motors	10/-	46/3		20	20*	4 6 6	46/3	39/9
Brush Ord.	5/-	8/3	−9d	6	10	6 1 3	9/6	7/7
Bulgin, A. F.	1/-	7/6	−3d	30	45	6 0 0	8/-	4/-
Burco Dean	5/-	13/9		—	—	—	—	—
Chloride El. Storage	£1	68/9	−1/3	12½	17½	5 1 9	77/6	58/6
Clarke Chapman	£1	102/6		20	20*	3 18 1	102/6	68/9
Cole, E. K.	5/-	23/-		27½	17½*	3 16 0	25/6	18/3
Cossor, A. C.	5/-	12/-	+6d	10	10	4 3 3	14/-	8/9
Crabtree	10/-	30/9	−6d	17½	20	6 10 0	34/6	29/3
Crompton Parkinson Ord. ...	5/-	16/6	−6d	20	20	—	19/9	16/-
De La Rue	5/-	21/3	+6d	20	30	7 1 3	26/-]	18/9
Decca	4/-	40/-		35	56½*	—	48/9]	31/-
Desoutter	5/-	33/9	+1/3	20	25	3 14 0	35/-]	25/6
Dewhurst	2/-	10/-		19	24	4 16 0	10/6	7/3
Dictograph Tel.	2/-	9/3		20	20	4 6 3	7/6]	6/6
Dubilier Condenser	1/-	4/3	−3d	25	25*	5 17 9	5/7]	3/10
E.M.I.	10/-	27/6		8	10	3 12 9	37/-	25/3
Electrical Components	5/-	18/9		20	25	6 13 4	21/3	15/3
Elec. Construction	£1	35/-		15	8½*	4 17 2	41/3	31/6
Enfield Cable Ord.	£1	21/3	+1/3	Nil	Nil	Nil	25/3	20/-
English Electric	£1	80/-	+5/3	10	12½	3 2 6	86/9	54/3
English Electric 3¾% Pref. ...	£1	14/-		3¾	3¾	5 7 3	16/9	14/-
Ericsson Tel.	5/-	41/6	+2/-	25†	20†*	2 8 9†	46/6	29/-
Ever Ready	5/-	32/6	−1/3	40	35*	5 7 9	38/-	22/3
Falk Stadelmann	£1	45/9		15	15	6 11 2	52/6	43/9
G.E.C. Ord.	£1	70/-x.d.	+1/-	12½	14	4 0 0	80/3	51/3
G.E.C. 6½% Pref.	£1	23/9		6½	6½	5 9 5	28/4	23/6
General Cables	5/-	15/-	−3d	30	30	10 0 0	17/-	15/-
Greenwood & Batley	£1	57/6		17½	17½	6 1 9	57/6	54/6
Hackbridge Cable	5/-	19/9	+3d	20	20	5 1 3	22/6	14/-
Hackbridge & Hewittic	5/-	19/9	+3d	25	30	—	—	—
Hall Tel. Acc.	10/-	18/6	−3d	10	10	5 8 0	22/6	11/-
Heatrae	2/-	5/-	−3d	12½	15	6 0 0	5/9	4/3
Henley's	10/-	18/-		10½	10½	5 16 0	21/3	17/-
Holophane	5/-	17/6		20	25	7 2 10	19/9	16/-

* After scrip issue. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

sufficient earnings in the other parts of the business to maintain the present dividends. He expresses the view that we have not yet begun to see the potentialities of electronics in industry. Such considerations account, of course, for the quotation of the shares, at around 40s, on a yield basis of only 3⅛ per cent. Another factor is the conservative character of the present dividend, which is to be 12½ per cent on capital doubled by the coming 100 per cent scrip issue. Net profits improved in the latest year from £260,000 to over a million, and cover more than five times the amount of the ordinary distribution.

in Electrical Investments

Company or Board	Nom. Value	Middle price 29th Aug.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1955 Highest	1955 Lowest
Equipment and Manufacturing—continued								
Hoover	5/-	44/6	−6d	45	70	7 17 3	52/6	40/-
I.C.I.	£1	51/6	−6d	15	10*	3 17 9	61/9	38/3
Intl. Combustion	5/-	20/-	−1/6	20	25	—	24/6	16/3
Johnson & Phillips	£1	43/3	+3d	15	15	6 18 9	52/6	41/-
Lancashire Dynamo	£1	55/-		14	15	—	56/3	37/3
Laurence, Scott	5/-	18/-		20	12½*	3 9 0	19/6	14/6
Lister, R. A.	£1	32/6		12	9·3*	5 14 6	40/-	30/6
London Elec. Wire	£1	51/3	−2/-	10	12½	4 17 6	61/3	50/6
Lucas, J.	£1	47/3	+1/-	10·8	7½*	3 3 6	56/6	41/6
Marryat & Scott	2/-	12/3		25	30	4 18 0	13/-	9/6
Mather & Platt	£1	69/6	−3/6	15	13·4*	3 17 3	75/-	48.-
Metal Industries	£1	26/9	−1/6	9	9	6 14 6	38/-	28/-
Midland Elec. Mfg.	£1	50/-	−2/6	15	10*	4 0 0	55/-	44/-
Morphy-Richards	4/-	27/6	−2/6	40	35*	5 1 9	35/-	27/-
Murex	£1	60/-	−9d	15	15	5 0 0	66/-	49/3
Newman Ind.	2/-	2/9		10	10	7 5 6	3/6	2/4
Oldham & Son	1/-	3/-	−9d	17½	20	6 13 4	4/-	2/10
Parnall (Yate)	5/-	9/3	−3d	8	14	7 11 3	13/2	7/3
Parsons, C. A.	£1	88/9	+1/3	7½	10	2 5 0	100/-	56/-
Plessey	10/-	73/9	+2/6	30	20*	2 14 3	89/-	57/6
Pye Deferred	5/-	40/-	−1/3	20	12½*	3 2 6	47/6	28/6
Revo	10/-	13/9		27½	9*	6 11 0	15/6	12/6
Reyrolle	£1	110/-	−5/-	13¾	15	2 14 6	127/6	89/-
Rheostatic	4/-	13/3		20	22½	—	14/3	9/3
Richardsons Westgarth	5/-	16/3	+3d	15	15*	4 12 3	19/-	11/-
Scottish Cables	4/-	18/9	−9d	27½	27½	5 17 3	22/6	18/9
Smith (England), S.	4/-	17/6		15	17½	4 0 0	20/-	15/-
Southern Areas	£1	32/6	−1/3	7½	10	6 3 0	38/-	27/6
Strand Elec.	5/-	13/3	+2/-	17½	15*	5 13 3	13/3	8/6
Sturtevant	5/-	31/3	−1/3	18·9	14·4†*	2 6 0†	35/9	21/-
Sun. Elec.	£1	35/-		15	15	8 11 6	35/-	33/9
Switchgear & Cowans	5/-	13/9		10	20	7 5 6	17/-	11/-
Taylor Tunnicliff	5/-	13/9	−1/6	12½	15	5 9 0	16/3	11/3
T.C.C.	10/-	52/6	−1/3	30	25*	4 15 3	53/9	41/-
T.C. & M.	£1	33/-	−6d	8½	8½	5 3 0	40/9	32/-
Telephone Mfg.	5/-	10/9	−9d	10	10	4 13 0	11/6	9/3
Thorn Elec.	5/-	23/9	+9d	20	15*	3 3 3	33/-	13/9
Thornycroft	£1	45/-		15	15	—	47/6	34/6
Tube Investments	£1	95/-	−5/-	15	17½	3 13 9	107/6	72/6
Vactric	5/-	17/6		10	15*	4 5 9	22/-	12/-
Veritys	5/-	11/-	+1/-	12½	12½	5 13 3	11/-	7/-
Walsall Conduits	4/-	14/6	−1/3	70	70	—	—	—
Ward & Goldstone	5/-	35/-	−1/3	50	30*	4 5 9	45/-	35/-
Watford	2/-	8/-	−3d	22½	25	—	8/9	6/3
Westinghouse Brake	£1	98/9	−1/3	16	18	3 13 0	110/-	82/-
West, Allen	5/-	14/-	−6d	17½	15*	5 7 3	16/6	8/-
Wolf Electric	5/-	20/-	−1/-	17½	20	5 0 0	21/-	16/1
Trusts, Transport and Communications								
Anglo-Am Tel.:								
A. Ord.	100	67½	−3	6	6	8 17 6	88	67½
Ord.	100	45		3½	3½	8 6 8	54½	45
Anglo-Portuguese	£1	23/-	−1/6	8	8	6 19 3	27/-	21/-
Brit. Elec. Traction:								
Def. Ord.	5/-	21/-	+6d	50	22½*	5 7 3	24/3	19/6
Cable & Wireless:								
Ord.	£1	47/6	−1/3	9	10	4 4 3	54/-	39/6
4% Loan	100	92½		4	4	4 6 6	100/-	92
Calcutta Trams	£1	26/-x.d.	+1/3	6†	7½††	5 15 6†	26/-	20/-
Cape Elec. Trams	£1	19/-		5½	7½	7 18 0	19/-	16/6
Marconi Marine	£1	36/3	−9d	10	10	5 10 3	41/3	33/-
Oriental Tel. Ord.	1/-	72/6	−10/-	16	—	—	102/6	72/6
Telephone Rentals	5/-	11/9	−6d	10	12½	5 6 6	13/6	9/6

Hall Telephone

After moving in recent months between extremes of 11s and 23s, Hall Telephone Accessories 10s shares have been quieter at around 18s 6d since news of the company's proposed entry into the fields of automation, electronics and instrumentation. A meeting is to be held on 9th September to consider an increase in the authorized capital by 400,000 shares, which would be issued in exchange for the share capital of James Gordon & Co., the automatic control specialists who also have connections with an American firm experienced in automation. Cash resources are to be augmented by the sale of the unissued proportion of the present authorized capital for a sum just short of £250,000. Hall Telephone have paid a 10 per cent rate of dividend in each year since the war.

Westinghouse Capital

Westinghouse Brake & Signal now have stockholders' approval to the increase in the authorized capital from £2½ to £3½ million, and in the borrowing powers to £6·7 million, which the company requires in connection with the financing of its development plans. Greatly increased productive capacity is needed to cope with a rapidly increasing order book, it was said at the recent meeting, when news was given of the proposal to acquire the business of Douglas (Kingswood), subject to official consent. For that deal, the intention is to obtain from bankers temporary loans which may be funded later. Westinghouse Brake ordinary shares have receded, in the general decline, from £5½ to under £5. The yield is still below 3¾ per cent, which signifies their high ranking among industrial investments.

Newton Brothers (Derby)

Although the ordinary distribution is again being raised, from 17½ to 20 per cent (including a bonus of 7½ per cent), Newton Bros. (Derby) 2s shares have come back a little since the announcement to about 7s, at which price the yield works out at rather less than 6 per cent. Trading profits for the year ended last March showed no great change from the good figures of the previous period, and, with a lower tax charge this time, the net surplus is up from £96,000 to £123,000, which covers almost four times over the amount of the dividend payment on the £276,500 ordinary capital. In the market the shares are coupled with those of other companies whose products are likely to meet special demands as a result of the programme now in hand for the electrification of the railways.

REPORTS and DIVIDENDS

Pye, Ltd.—The report and accounts for the year ended 31st March last show group trading profits of £2,485,458, as compared with £1,416,405 for the preceding year. After meeting all charges, including £1,161,677 for taxation, the net balance is £1,023,560 (against £260,531), to which is added adjustments relating to previous years, making £1,107,681. As already reported, it is proposed to make a one-for-one capitalization issue and to pay a dividend of 12½ per cent on the resulting increased deferred capital. The dividend is equivalent to 25 per cent on the capital existing before the capitalization issue, which has already been increased by two "rights" issues during the year. The dividend for the previous year on the smaller capital was 20 per cent. The balance carried forward in the accounts of Pye, Ltd., is £861,095 (£334,747), and in the accounts of subsidiaries £808,490 (£535,390).

In the statement which accompanies the report and accounts, Mr. C. O. Stanley (chairman) says that turnover in the home and export markets showed a marked increase. Some time ago the company realized that if there were a recession in the radio and television industry the effect might be serious and they therefore embarked on expansion by entering fields entirely different from those in connection with radio and television sets. In the scientific instrument field they are rapidly coming to the front, while the communication company already makes a substantial contribution to profits. Probably the field which will in the long run bring the greatest development is that of general electronics.

The Sterling Cable Co., Ltd., reports a group profit for the year to 31st March last of £75,038, as compared with £80,390 for 1953-54, to which is added adjustments of £4,053 from previous years. Taxation requires £45,183, leaving a net balance of £33,908 (against £36,409). The dividend for the year is unchanged at 10 per cent and the balance carried forward is £45,398 (against £36,995 brought in).

Strand Electric Holdings, Ltd., reports a group profit for the year to 30th April last of £54,280, as compared with £50,740, and after charging taxation, the net balance is £28,684 (against £23,972). It is proposed to pay a dividend of 15 per cent on capital of £172,500 as increased by a proposed scrip issue to ordinary shareholders on the basis of one new ordinary share for every two held. For the previous year the dividend on £115,000 capital was 17½ per cent.

Lancashire Dynamo Holdings, Ltd., is maintaining its interim ordinary dividend at 4 per cent on capital increased by a one-for-two issue. It is stated that this must not be taken to imply an equal or increased total dividend for the year.

The Automatic Telephone & Electric Co., Ltd., has declared an interim dividend of 3 per cent (unchanged) on the ordinary stock.

Cable & Wireless (Holding), Ltd.—An interim dividend of 10d per £1 unit has been declared on the ordinary stock.

New Companies

Burnie & Harriman, Ltd.—Registered in Edinburgh 13th August. Capital £75. Radio, electrical, motor, mechanical and general engineers, etc. Directors: J. A. Burnie, C. Harriman and D. Johnstone. Regd. office: 38, High Street, Dalbeattie.

Darlec, Ltd. — Registered 19th August. Capital £5,000. Wholesalers, retailers, importers, exporters and manufacturers of and dealers in electrical goods, apparatus, appliances, etc. Directors: R. J. King, L. Rowell and J. Ingledew. Regd. office: 15, Post House, Wynd, Darlington.

Norman Thomas (Television), Ltd.—Registered 20th August. Capital £1,000. Manufacturers and distributors of, agents for and dealers in electrical goods, radio and television sets, etc. Directors: J. N. Vinall and F. T. Williams. Regd. office: 151, Strand, W.C.2.

J. Taylor & Co. (Gt. Britain), Ltd.—Registered in Belfast 9th August. Capital £10,000. Manufacturers of electric neon signs, fluorescent light fittings and installations, etc. Directors: T. Taylor, F. H. Taylor, J. E. Taylor and W. J. Taylor. Regd. office: 101, North Street, Belfast.

Ketay, Ltd. — Registered 20th August. Capital £50,000. Manufacturers of and dealers in mechanical, electrical and electronic instruments, appliances, components and equipment, etc. Subscribers: P. O. Ansell and A. Matthews, both of 116, Chancery Lane, W.C.2. The first directors are to be appointed by the subscribers.

Essoldomatic, Ltd.—Registered 22nd August. Capital £200. Designers and manufacturers of and dealers in all kinds of electronic, electrical, radio, radar, television, photographic and cinematograph apparatus and appliances, etc. The first directors are not named. Solicitors: Clifford-Turner & Co., 11, Old Jewry, E.C.2.

M.B.I. Electrical Co., Ltd.—Registered 24th August. Capital £1,000. Manufacturers of and dealers in electrical fittings and appliances, etc. Directors: R. Brosan and Margaret Brosan (directors of M. Brosan, Ltd., etc.). Secretary: Joan Richardson. Regd. office: 245, High Road, Kilburn, N.W.6.

Stevenson & Rennie, Ltd.—Registered in Edinburgh 18th August. Capital £6,000. Radio, television, electrical and motor engineers, etc. Directors: R. G. Stevenson (secretary) and A. Rennie. Regd. office: 8, Cathkin Drive, Clarkston, Renfrew.

Increase of Capital

Swift S.M. (London), Ltd.—Increased by £500, in £1 8 per cent cumulative redeemable preference shares, beyond the registered capital of £500.

Meeting of Creditors

Gilbert Electrical Tool Services, Ltd.—Meeting of creditors 7th September at 20, Park Row, Nottingham.

Liquidations

Newport's Electrics (Southampton), Ltd., electrical contractors.—Winding up voluntarily. Liquidator, Mr. N. W. Osborne, 11-12, Finsbury Square, London, E.C.2, appointed 4th August.

A. J. Dyer & Sons, Ltd., radio and electrical contractors and retailers.—Winding up voluntarily. Liquidator, Mr. N. W. Osborne, 11-12, Finsbury Square, London, E.C.2, appointed 12th August.

Brooks & Blewitt (Electrical & General Engineers), Ltd., Bristol.—Liquidator, Mr. P. W. Hort, 28, Baldwin Street, Bristol, released 14th July.

Spiroto Regulators, Ltd., manufacturers of voltage regulators.—Winding up voluntarily. Liquidator, Mr. C. A. Barber, 2, Finchley Road, London, N.W.8, appointed 5th August.

Bex Electric, Ltd.—Last day for receiving proofs for dividend 7th September. Liquidator, Mr. R. L. Davis, Bedford Row House, 58, Theobalds Road, London, W.C.1.

Bankruptcies

A. F. Ayers, 104, Bridgwater Drive, Westcliff-on-Sea, electrical contractor.—Trustee, Mr. W. J. W. Hill, 58-61, York Terrace, Regent's Park, London, N.W.1, Official Receiver, released 16th August.

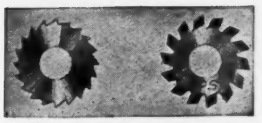
A. Fielder, 314, Shortheath Road, Erdington, Birmingham, and 4, Cooksey Lane, Erdington, Birmingham, trading as A. Fielder & Co., radio and electrical retailer.—Third and final dividend of 1d in the £, payable at the Official Receiver's office, Somerset House, 37, Temple Row, Birmingham, 2. (Amended notice.)

S. Sidwell, 51, Islington Row, Birmingham, electrical engineer.—Adjudication order dated 8th December, 1923, annulled and receiving order made on the same date rescinded 10th August, debts, costs and charges having been paid in full.

MARTINDALE

MICA UNDERCUTTING *System No. 2*

Quick, clean "U" or "V" undercutting of almost any size or type of commutator can be effected with the aid of power milling tools as illustrated.



Undercutting Saw — Undercutting "V" Cutter

Monarch Undercutter (Flex-Drive)

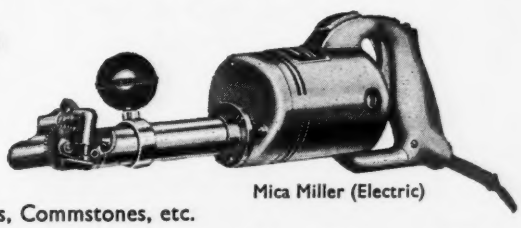
Monarch Undercutter (Pneumatic)

Mica Miller (Flex-Drive)

Mica Miller (Pneumatic)

With small saws or "V" cutters slots can be cut almost to the risers and only in special cases is it necessary to complete the cuts by file.

The milling heads are interchangeable with the oscillating heads of the Mica Slotters used in the Martindale System No. 1.



Mica Miller (Electric)

Write for details of other Martindale Undercutters, Fault Finders, Commstones, etc.

also at
25 Elmbank Street, Glasgow, C.2

MARTINDALE ELECTRIC CO. LTD.
4 WESTMORLAND ROAD, LONDON, N.W.9

LEGG INDUSTRIES LIMITED

Legg Industries Limited design and manufacture Charging Equipment for Electric Vehicles and Trucks of all types and the majority of leading manufacturers specify LEGG CHARGERS for use with their equipment—both at Home and Abroad.

WHEN YOU PURCHASE A LEGG CHARGER YOU ENSURE YEARS OF RELIABLE SERVICE

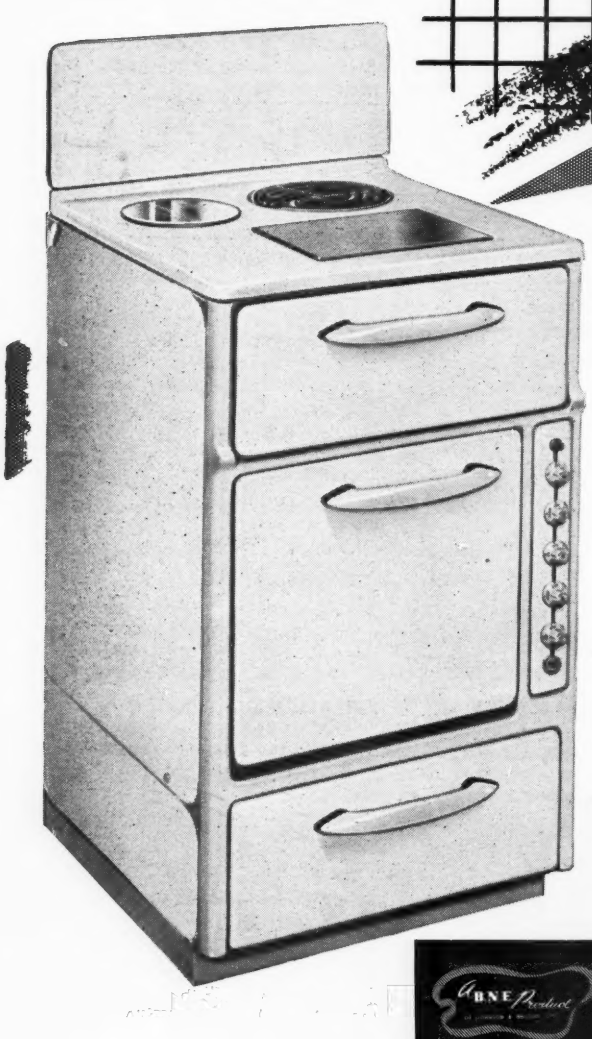
Chargers are also designed and manufactured to comply with C.S.A. requirements.

Legg **VEHICLE CHARGERS**

LEGG (INDUSTRIES) LTD.
WILLIAMSON ST., WOLVERHAMPTON

57230

THIS NEW B·N·E C.90...
WITH THE * SPEEDHEAT OVEN
WILL SPEED YOUR SALES
Like this....



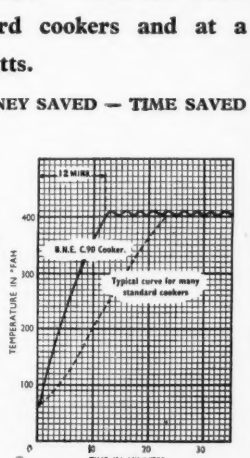
PRE-HEATING TIME...

Up to 400°F. in 12 minutes — half the usual time of many standard cookers and at a loading of only 2,500 watts.

ELECTRICITY SAVED — MONEY SAVED — TIME SAVED

THE OVEN CHART

This is an outstanding performance, which is a convincing selling point and is simple to explain. Add to it B.N.E. solid quality construction and refinements at no extra cost, and you have quicker and easier selling too!



*SPEEDHEAT DOES SELL!

A B N E Product

BRITISH NATIONAL ELECTRICS LTD.
The Domestic Appliance Section of JOHNSON & PHILLIPS LTD.
NEWARTHILL · MOTHERWELL · SCOTLAND

GENERATION AND DEVELOPMENT

Objections to Overhead Lines

The Kettering Rural District Council is objecting to the erection of 12 miles of overhead line in its area, alleging that it would mar the countryside and constitute a danger to life. A recent aircraft accident has been cited. The Central Electricity Authority has stated that to place the line underground would entail an extra cost of over £40,000 a mile. Its offer to vary the route to avoid two villages is not acceptable to the R.D.C.

Objections are also being raised by the Middlesex County Council to a proposed line from Elstree to Iver Heath because it would necessitate the felling of trees at Denham Court.

Electric Plugs in Council Houses

The Easington (Co. Durham) R.D.C. has approved a proposal by the surveyor (Mr. R. R. Lumsden) to install electric plugs in older council houses. The total cost will be over £10,000, averaging £4 per house. The surveyor, in a report to the Council, referred to the increased use of electrical appliances in the home, and said that many of the old council houses were totally unsuited to provide such facilities.

South Wales Tariff Revision

Proposals of the South Wales Electricity Board for an increase in tariffs were recently considered by the South Wales Electricity Consultative Council. Since standard tariffs were introduced in April, 1952, costs have risen substantially. Increased consumption and greater efficiency have hitherto enabled the Board to meet to some extent these additional costs without increasing tariffs. The recent substantial rise in the price of coal, together with national increases in salaries and wages have, however, increased the Board's costs to an extent which makes a revision of tariffs imperative. The increases proposed are as follows:—Domestic tariff and commercial block rate tariff: The primary rate to be increased from 5d to 5¼d per kWh and the follow-on rate from 0·85d to 1d per kWh. Farm tariff: The primary rate to be increased from 5d to 5¼d per kWh; the intermediate rate from 2½d to 2¾d per kWh; and the final rate from 0·85d to 1d per kWh. Industrial block rate tariff: Rate for the first 1,000 kWh a month to be increased from 2d to 2¼d per kWh; for the next 5,000 kWh from 1¾d to 2d per kWh; and for all in excess in the same month from 0·85d to 1d per kWh. It is also proposed to increase charges to local authorities for street lighting purposes.

It is intended to apply the increases to electricity consumed after the first meter reading following 30th September next. In stable conditions, the proposed increases should have the desired effect of preserving the Board's financial equilibrium. On the basis of present estimates the margin of revenue over costs will be small but the Board will endeavour to avoid further increases in the tariffs now being altered unless compelled to do so by further increases of costs beyond its control. Maximum demand industrial and commercial tariffs and agreements incorporate clauses which provide for an automatic increase in charges when the price of coal increases. These tariffs, therefore, are not affected by the Board's present proposals.

Price Reduction in Jersey

The Jersey Electricity Co., Ltd., tells us that with the recent introduction of a domestic block tariff in place of the previous two-part tariff, prices to domestic consumers have again been reduced. This makes the eighth reduction in electricity tariffs since Mr. W. K. Allen, the managing director, took over control of the company in 1953. Sales of electricity so far this year are up by nearly 20 per cent on last year's figures.

Rural Electrification in Ireland

Figures published last week by the Electricity Supply Board indicate that over half of the rural electrification scheme has been completed to date. The scheme calls for electrification of 780 rural areas throughout the Republic's 26 counties. Of these 395 have been completed so far, bringing the total number of rural consumers at the end of July to 148,623. Construction work is carried out on an area basis—an area comprises 25 sq miles approximately—and generally conforms to a parish. To date 479 areas have been selected and only 84 of these remain to be completed.

Farmers are growing electrically minded and the number of all-electric farms in the country is increasing rapidly. The average farmer is using electricity to an increasing degree each year. The extent to which consumption is increasing in the earlier areas may be seen from figures which show the average annual consumption per consumer in representative areas connected during the earlier years. In 1949 that average was 509 kWh and in 1955 it had increased to 1,334 kWh.

Volcanic Steam in Kenya

The Nairobi correspondent of the *Financial Times* reports that Balfour, Beatty & Co. are making full-scale investigations into the possibility of using volcanic steam in the Rift Valley, Kenya, for the generation of electricity. If the boreholes, which will be sunk to a depth of at least 3,000ft, provide sufficient steam a pilot plant will be installed to determine the best means of using it.

Israel Power Expansion

Two new power stations are now in course of construction in Israel which, when completed, will increase the supply of electricity for domestic and industrial purposes by about 60 per cent. One, in the Tel Aviv area, will be completed early next year and will add 40,000 kW to the present capacity. The second plant is situated in the southern part of the country, at Sukreir, and will have a capacity of 100,000 kW. This equals the capacity of the Reading power station in Tel Aviv. The Sukreir plant is scheduled to supply 50,000 kW in the summer of 1957 and to reach its full production capacity early in 1958. Israel's present power producing capacity is 237,000 kW. During 1954 consumption reached 901 million kWh, of which 201 million was used for agricultural and 261 million for industrial purposes.

Russian D.C. Transmission Study

The Soviet Ministry of Power Economy is planning to go over to direct current for long-distance transmission. In order to study this a special Direct Current Scientific Institute has been set up and a test d.c. power line about 60-70 miles long has been installed. Special rectifier stations have been constructed, and over 500 million kWh has already been transmitted along the test line. Plans are on foot to build a similar line about 400 miles long.

An 11 kV cable being laid to Osea Island in the Blackwater Estuary for the Essex Sub-Area, Eastern Electricity Board, by the Contract Department of Johnson & Phillips, Ltd.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 0d each including postage) will be obtainable after 5th October from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1949

6673. Deshaw, Z.—Electric incandescent lamps. 12th June, 1950. (737861.)

6674. Ismay Lamps, Ltd.—Electric incandescent lamps. 12th June, 1950. (737862.)

16590. National Research Development Corporation.—Electronic digital computing machines. 21st June, 1950. (737863.)

1950

921. Standard Telephones & Cables, Ltd.—Selection system for electrical circuits or equipments. 13th January, 1950. (737865.)

922. Standard Telephones & Cables, Ltd.—Automatic telecommunication exchanges. 13th January, 1950. (737866.)

11161. Standard Telephones & Cables, Ltd.—System for the scanning and selection of electrical circuits or equipments. 5th May, 1950. (737870.)

1951

12512. Siemens & Halske Akt.-Ges.—Dry rectifiers. 28th May, 1951. (737871.)

13080. General Electric Co., Ltd., and Jenkins, H. G.—High pressure mercury vapour electric discharge lamps. 3rd June, 1952. (737913.)

16218. Standard Telephones & Cables, Ltd.—Radio antennæ. 4th July, 1952. (737872.)

18095. General Electric Co., Ltd., Gooding, P. E., and McKeag, A. H.—Luminescent materials. 15th July, 1952. (737914.)

19736. British Broadcasting Corporation.—Slot aerials. 15th August, 1952. (737873.)

29093. Loewe Opta Akt.-Ges.—Gas-discharge fluorescent tube supply circuit. 12th December, 1951. (738075.)

1952

569. Syntron Co.—Selenium rectifiers and method of making same. 8th January, 1952. (737783.)

1638. Petrolite Corporation, Ltd.—Electric treatment of emulsions of the oil-continuous type. 21st January, 1952. (737916.)

2734. Standard Telephones & Cables, Ltd.—Telecommunication system. 1st February, 1952. (737917.)

2780. Cathodeon, Ltd.—Electron discharge devices. 1st May, 1953. (738077.)

2885. Standard Telephones & Cables, Ltd.—System for the scanning and selection of electrical circuits or equipments. 5th May, 1950. (737876.)

2886. Standard Telephones & Cables, Ltd.—Electrical testing equipment for use in an automatic telecommunication exchange. 5th May, 1950. (737877.)

12864. British Thomson-Houston Co., Ltd.—Pulse generating circuits. 20th May, 1953. (738002.)

13017. Metropolitan-Vickers Electrical Co., Ltd.—Electric battery charging circuits. 2nd April, 1953. (738081.)

14220. Mullard Radio Valve Co., Ltd.—Thermionic valves. 1st June, 1953. (737883.)

18005-6. General Electric Co., Ltd., and Gallizia, E.—Electric convertor arrangements. 29th June, 1953. (737922/3.)

18864. Standard Telephones & Cables, Ltd.—Television receivers. 17th July, 1953. (737784.)

24727. General Electric Co., Ltd., and Smart, A. T.—Electronic balancing apparatus. 2nd October, 1953. (737795.)

27196. Philips Electrical Industries, Ltd.—Extrusion presses for coating welding rods. 29th October, 1952. (737797.)

27441. Standard Telephones & Cables, Ltd.—Automatic telecommunication exchange. 13th January, 1950. (737890.)

27625. General Electric Co.—Electron-discharge devices. 3rd November, 1952. (738087.)

28346. Parsons, Ltd., C. H., and Handley, G. B.—Electric switches including a mercury container. 11th November, 1953. (738088.)

30540. General Electric Co.—Fan and motor unit assemblies. 2nd December, 1952. (737802.)

31199. Bailey Meters & Controls, Ltd.—Remote electrical indicating or/and control systems. 9th December, 1953. (737804.)

31423. Metropolitan-Vickers Electrical Co., Ltd.—Electrical resistance thermometers. 4th December, 1953. (737805.)

32145. Associated Electrical Industries, Ltd.—Electronic apparatus for counting electrical impulses. 11th January, 1954. (737807.)

32677. Babcock & Wilcox, Ltd.—Tubulous vapour generating and vapour heating units. 18th December, 1953. (738092.)

1953

2768. Siemens Bros. & Co., Ltd.—Electromagnetic telephone instruments. 22nd January, 1954. (738029.)

3954. Lucas (Industries), Ltd., J.—Electric rheostats. 6th April, 1954. (737901.)

6649. English Electric Co., Ltd.—Artificial feel systems for aircraft controls. 5th March, 1954. (737812.)

7234. Siemens-Schuckertwerke Akt.-Ges.—Non-hardenable insulating material. 16th March, 1953. (738037.)

7409. Marconi's Wireless Telegraph Co., Ltd.—Piezo-electric crystal and mount assemblies. 8th January, 1954. (737815.)

7946. Compagnie Générale de Télégraphie sans Fil.—Radar systems. 23rd March, 1953. (737818.)

9109. Marconi's Wireless Telegraph Co., Ltd.—Radar systems. 12th March, 1954. (737819.)

9209. Philips Electrical Industries, Ltd.—Lighting systems embodying electric discharge tubes. 2nd April, 1953. (737938.)

13291. Marconi's Wireless Telegraph Co., Ltd.—Electrical pulse generating trigger circuit arrangements. 23rd April, 1954. (737945.)

17056. General Electric Co., Ltd., and Page, B. H.—Resilient support arrangements for electric motors. 15th June, 1954. (737825.)

17652. General Electric Co.—Plastic working of semiconductors. 25th June, 1953. (737950.)

19575. Telefonaktiebolaget L. M. Ericsson.—Electric apparatus in which the electron beam of one or more trochotrons is intended to be directed in synchronism with the stepping velocity of the electron beam of a controlling trochotron or in synchronism with a multiple of said stepping velocity. 14th July, 1953. (737954.)

20491. Strong Electric Corporation.—Lamps. 23rd July, 1953. (738108.)

21141. Erie Resistor Corporation.—Thermo-electric device. 30th July, 1953. (737827.)

21517. Soc. des Accumulateurs Fixés et de Traction.—Electric storage batteries. 4th August, 1953. (738110.)

21872. Müller, J., Bär, K., Bär, P., and Müller, W.—Thermostatically actuated valves. 7th August, 1953. (737960.)

22947. Standard Telephones & Cables, Ltd.—Mounting of electrodes in electric-discharge devices. 20th August, 1953. (738115.)

24266. Philips Electrical Industries, Ltd.—Low-pressure mercury vapour discharge lamps. 2nd September, 1953. (737828.)

24545. Standard Telephones & Cables, Ltd.—Secondary emitting electrode. 4th September, 1953. (738120.)

25187. Philips Electrical Industries, Ltd.—Variable magnetic electron lenses. 11th September, 1953. (738121.)

27015. Bosch Ges., R.—Dynamo-electric machines having improved brush gear. 2nd October, 1953. (738127.)

27650. Etablissements Merlin & Gerin, Soc. Anon.—Protective arrangement particularly for coal face lighting systems. 8th October, 1953. (738129.)

28972. Siemens & Halske Akt.-Ges.—Track apparatus for railway traffic control systems. 20th October, 1953. (738132.)

29660. Radio Corporation of America.—Transistor electrode contacts. 27th October, 1953. (737979.)

30017. Imperial Chemical Industries, Ltd.—Electric igniters. 5th July, 1954. (737835.)

30061. General Electric Co.—Electric time switches. 30th October, 1953. (737836.)

30806. General Electric Co.—Time control means for electrically heated receptacles. 6th November, 1953. (737838.)

32861. Siemens-Schuckertwerke Akt.-Ges.—Electric contact arrangement. 26th November, 1953. (738144.)

33009. Radio Corporation of America.—Radio transceiver circuits. 27th November, 1953. (738145.)

33163. Allmanna Svenska Elektriska Aktiebolaget.—Protective means for high voltage d.c. transmission. 30th November, 1953. (737846.)

33249. Radio-Industrie.—Distant synchronization of television equipment. 30th November, 1953. (737847.)

33504. Collins Radio Co.—High frequency variable inductors. 2nd December, 1953. (738146.)

33507. Collins Radio Co.—Temperature compensation arrangements for permeability tuned variable inductors. 2nd December, 1953. (738147.)

34179. Belling & Lee, Ltd.—Television aerials. 8th December, 1953. (738148.)

34284. Radio Corporation of America.—Television system. 9th December, 1953. (737851.)

34514. Standard Telephones & Cables, Ltd.—Method of producing electrical condensers. 11th December, 1953. (737853.)

35642. Allis-Chalmers Manufacturing Co.—Hydraulically operated electric circuit interrupting devices. 22nd December, 1953. (738150.)

35797. Siemens-Schuckertwerke Akt.-Ges.—Lattice bars for electric machines and apparatus. 23rd December, 1953. (737856.)

Lebanese Power Scheme

A loan of $27 million has been made to the Litani River Authority (a Government sponsored body) for the construction of an irrigation and power scheme on the Litani River, Lebanon. It is stated that apart from providing for the irrigation of 8,500 acres, the scheme will double the present power capacity of Lebanon.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—27th October. Western Australian Government Tender Board, Perth. Two steam turbine driven centrifugal blowers. (E.S.B. 17482/55. Ten/15165.)*

Bebington.—19th September. Corporation. Street lighting equipment. (See this issue.)

Belfast.—22nd September. R.D.C. Street lighting equipment. Council's engineer, Council Offices, "Hazelbank," White House, Belfast.

Breadbury and Romiley.—10th September. U.D.C. Electrical installations in 56 houses, Cherry Tree estate. T. Hodkinson, surveyor, Council Offices, George Lane, Breadbury.

Chard.—22nd September. Borough Council. Street lighting equipment. (See this issue.)

Cuba.—14th September. Primera Central Hidroelectrica Cubana, Havana. Turbines, etc., for Hanabilla project. (E.S.B. 17875/55. Ten/15256.)*

Edinburgh.—North of Scotland Hydro-Electric Board. Electrical installation in Achanalt power station. (See this issue.)

Formosa.—13th September. Central Trust of China, Taipei. 34·5 kV metering equipment. (E.S.B. 17196/55. Ten/15158.)* 14th September. Steam generating plant. (E.S.B. 17190/55. Ten/15150.)*

India.—15th September. Superintending Engineer, Technical (Electrical), Madras. 33 kV cables and cable boxes. (E.S.B. 17478/55. Ten/15155.)*

21st November. Madhya Pradesh Electricity Board, Nagpur. Two 180,000 lb/hr water tube boilers. (E.S.B. 17806/55. Ten/15213.)*

26th November. Stores Purchase Committee, Government Secretariat, Trivandrum. Generating station equipment comprising water turbines, generators, transformers, switchgear and ancillary equipment for Neriamangalam hydro-electric project. (E.S.B. 17476/55. Ten/15180.)*

Luxembourg.—1st October. Ministére des Transports et de l'Electricité. Electrical equipment for the barrage works at Esch-sur-Sure. (E.S.B. 17475/55. Ten/15191.)*

Newcastle-on-Tyne.—City Council. Electrical installations in 104 houses on the Westerhope estate; 12 houses in Grasmere Avenue, Walker; 28 three-storey flats and maisonnettes and 16 houses on the Slatyford Lane estate; and 24 flats at Byker Bank. City architect, 18, Cloth Market.

New Zealand.—20th September. Christchurch Municipal Electricity Department. Fifteen 750 kVA transformers. (E.S.B. 17444/55. Ten/15140.)*

26th September. Post and Telegraph Department, Wellington. Six portable water conductivity testers. (E.S.B. 17721/55. Ten/15197.)*

27th October. State Hydro-Electric Department, Wellington. Steel cored aluminium conductor and accessories, Islington-Kikiwa 220 kV line. (E.S.B. 17722/55. Ten/15202.)*

Pakistan.—14th September. Director-General, Posts and Telegraphs Department, Karachi. Equipment for duplex radio telegraph/telephone link between Dacca and Saidpur. (E.S.B. 17638/55. Ten/15189.)*

Philippines.—16th September. National Power Corporation, Manila. Two hydraulic turbines, governors and two inlet valves, and/or two generators, transformers and switchgear for the Agusan River hydro-electric project. (E.S.B. 17753/55. Ten/15229.)*

Portadown.—16th September. Northern Ireland Fire Authority. Electrical installation in Southern Division headquarters and fire station, Thomas Street. Borough surveyor, Thomas Street, Portadown.

South Africa.—22nd September. Union Tender & Supplies Board, Pretoria. Projection lamps. (E.S.B. 17640/55. Ten/15196.)*

7th October. Durban Corporation Electricity Department. Two 15,000 kVA transformers. (E.S.B. 17699/55. Ten/15199.)*

Sunderland.—Corporation. Electrical installation in a health centre being built at Springwell Road. Borough architect, Grange House, Stockton Road.

Wakefield.—17th September. Hospital Management Committee No. 9. Firms desirous of being included in lists of approved firms from whom tenders may be invited for supplies of electric lamps and fittings for hospitals should make application to W. Read, group secretary, 113, Northgate, Wakefield.

United States.—21st September. Corps of Engineers, U.S. Army, Little Rock, Arkansas. 90,750/121,000 kVA three-phase transformer. (E.S.B. 18256/55. Ten/15304.)*

ORDERS PLACED

Durham.—County Council. Accepted. Electrical installation at Neville's Cross Training College (£12,608).—North of England Engineering and Electrical Co.

Hull.—Corporation Water Committee. Accepted. Diesel-electric pumping plant at the Springhead pumping station (£73,188).—Harland Engineering Co.

London.—L.C.C. Accepted. Renewal and improvement of electrical installation at Wandsworth County School (£4,988).—Powerlite Electrical Installations.

Oxford.—Sewage Disposal Committee. Recommended. Major part of the electrical installations for the new sewage disposal works (£11,359).—Southern Electricity Board.

Ramsgate.—Corporation. Recommended. Conversion of street lighting from gas to electricity, stage 4 (£14,403).—South Eastern Electricity Board.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Banstead.—Lifts and shafts in three blocks at Banstead Hospital (£17,900), for South West Metropolitan Regional Hospital Board; architect to the Board, 76, Wimpole Street, London, W.1.

Beckenham.—Out-patients' department at Beckenham Hospital (£77,000), for South East Metropolitan Regional Hospital Board; architect to the Board, 9, Hallam Street, London, W.1.

Bedford.—Three blocks of ten- or eleven-storey flats in St. Johns Street; borough architect.

Fire station; county architect.

Bexhill-on-Sea.—Extensions to County Grammar School (£64,616), for East Sussex E.C.; E. A. Verger, county architect, County Hall, Lewes.

Birmingham.—Warehouse and showroom at Edmund Street for Wilkinson & Riddell (Holdings), Ltd.; Watson, Johnson & Stokes, architects, Victoria Square.

Bolton.—Offices, workshop and stores block on site off Raikes Lane; Belcher Radio Services, Ltd., 50 Grosvenor Street.

Bristol.—Branch libraries at Filton Broadway and Southmead; city architect.

Bromsgrove.—Six shops with dwellings over, on Charford estate, Section 13, for U.D.C.; R. H. Crump, quantity surveyor, 39, High Street.

Broughton.—Offices and mess block at Fire Brigade Headquarters (£40,260); G. Noel Hill, county architect, Fishergate Hill, Preston.

Chigwell.—Residential special school (£164,635), for Essex E.C.; H. Conolly, county architect, County Hall, Chelmsford.

Colchester.—12 shops and flats, Monkwick estate and Shrub End; borough surveyor.

Crawley.—Dwellings (801), at Tilgate, Stage 1, and six service industry workshops, Stephenson Place, Three Bridges; Crawley Development Corporation, Broadfield.

Darlington.—Factory additions for E.N.V. Engineering, Ltd.; D. and J. Ranken, Ltd., contractors, Stockton Road, Sunderland.

Felling (Co. Durham).—Three-storey flats, Leam Lane unit for the U.D.C.; R. Morton, housing architect.

Offices at Bill Quay Shipyard for R. B. Harrison and Son; R. T. James and Partners, architects, Clavering Place, Newcastle-on-Tyne.

Distribution depot; Cadbury Bros., Ltd., Bourneville, Birmingham.

Flint.—Houses (42), The Wern, Bagillt; borough engineer.

Fulham.—Chest clinic at the Western Hospital, Seagrave Road, London, S.W.6, for South West Metropolitan Regional Hospital Board; architect, 76, Wimpole Street, London, W.1.

Gillingham (Dorset).—Houses (40), at Tomlins Lane; J. Hoy, Council Offices, Bimport, Shaftesbury, Dorset.

Guildford.—Extension of nurses' home (£45,000), St. Luke's Hospital; C. H. Runnalls & Sons, Ltd., builders, 11a, Grove Road, Sutton.

Harrogate.—Extensions at Ashfield College for Governors; W. G. Birch, Ltd., Montpellier House.

Haughley. — Sewage disposal works (£65,000); Vibrated Concrete Construction Co., Ltd., contractors, 2, Caxton Street, London, S.W.1.

Keighley.—Library in Spencer Street; borough architect.

Kimberley.—Factory for Wolsey, Ltd., King Street, Leicester; Geo. Wimpey & Co., Ltd., builders, Chester Road, Castle Bromwich.

King's Lynn.—Houses (80), in four groups, on the Seabank estate, for B.C.; G. Holmes, housing architect, Clifton House, Queen Street.

Kington.—Houses (53), at Crooked Well; U.D.C. surveyor, 2, High Street.

Leamington Spa.—Block of 13 shops with flats, etc., at Crown Way, Lillington estate, for T.C.; Rayner and Fedeski, architects, 28, The Parade, Leamington Spa.

Leeds.—Aged persons' hostel at Acre Close, for T.C.; N. B. Bell & Co., Ltd., Frankland Terrace.

Lincoln.—Works extensions; Ruston & Hornsby, Ltd., Beevor Foundry.

Liverpool.—Factory, Shaw Road, Speke; Liverpool Packing Case Co., Ltd., 55-57, Park Road.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

London.—Preliminary training school, St. James's Hospital, Balham; Alan Marshall & Partners, consulting engineers, 115, Gloucester Place, W.1.

Showrooms and offices, 187/193, Oxford Street, Mayfair; Tersons, Ltd., builders, 4, Dollis Park, N.3.

Community centre and library, Pendrell Street, Woolwich; borough engineer.

Flats and maisonnettes (52), on permanent housing site No. 43, Camberwell Grove; town clerk, Town Hall, Peckham Road, S.E.5.

Manchester.—Pathology laboratory, Manchester Victoria Hospital; Manchester Regional Hospital Board, Cheetwood Road.

Warehouse and offices; Tennants, Ltd., Hazelbottom Road, Cheetham.

Morley.—Houses (140), together with flats and aged persons' bungalows, as development of Lowmoor estate; E. V. Finnegan, town clerk, Town Hall.

Newcastle-on-Tyne.—Block of offices on site of Rendezvous Restaurant, Pilgrim Street; R. W. Bell & Son, Mistletoe Road.

Warehouse, offices and garage, Stoddart Street, for H. Osborn, Ltd.; Cackett, Burns, Dick and Mackellar, architects, 21, Ellison Place.

North Cotswold.—Houses (38), at Bourton-on-the-Water and Moreton-in-Marsh; Thomas Rayson, architect to R.D.C. Council, 29, Beaumont Street, Oxford.

Norwich.—Science block (£40,000), King Edward VI Grammar School; E. Boardman & Son, architects, Queen Street.

Oldham.—Offices at Connaught Street, for Geo. Orme & Co. (Meters), Ltd.; Young & Purves, architects, 12, St. Anne's Square, Manchester.

Padiham.—Factory extension for Morley Products, Ltd., Manchester Road; Fred Mitchell & Son, Ltd., builders, River Place, City Road, Manchester.

Peterborough.—Warehouse, offices, etc., Padholme Road; A. B. Gibson, Ltd., provision merchants, Deacon Street.

Plymouth.—Divisional headquarters; Salvation Army, 113, Queen Victoria Street, London, E.C.4.

Pontypridd.—Methodist church, Poplar Road, Rhydfelin; Burgess & Burgess, architects, 30, Mill Street.

Poole.—Houses (38), off Ringwood Road; borough surveyor.

Portsmouth.—Operating theatre for St. James' Hospital; Oliver Law & Partners, architects, 36, Ebury Street, London, S.W.1.

Prudhoe (Northumberland).—Employment and stores blocks at Prudhoe Hospital for Newcastle Hospital Board, Benfield Road, Newcastle-on-Tyne (£85,000); P. H. Knighton, chief architect.

Redhill. — Out-patients' department (£105,000), for Redhill Hospital; Rice & Son, Ltd., builders, 15, Stockwell Road, London, S.W.9.

Romford.—Dwellings (102), Straight Road; borough surveyor.

Rotherham.—Shopping centre at Kimberworth Park estate for B.C.; C. Earnshaw (Rotherham), Ltd., 35, Coke Lane.

Royston.—Chemical production centre; Johnson Matthey & Co., Ltd., 78, Hatton Garden, London, E.C.1.

Rugby.—Three shops at Market Place, for Ravensert Properties, Ltd.; Bosworth & Wakeford, Ltd., New Street, Daventry.

Scunthorpe.—Crematorium for Town Council in Burringham Road; borough architect.

Sheffield.—Abbeydale Grammar School, for E.C.; Ackroyd & Abbott, Ltd., 47, Willoughby Street.

Showrooms and offices, The Moor; Montague Burton, Ltd., Hudson Road Mills, Leeds.

Stockton-on-Tees.—Additions to stores for Marks and Spencer, Ltd.; Norman Jones and Rigby, architects, Lord Street, Southport.

Stoke-on-Trent.—Housing on the Ubberley Farm estate (74 acres), and Holden Lane estate (33 acres); city engineer, Town Hall.

Whitley Bay.—Showrooms and offices; Falconer and Prentice, quantity surveyors, 17a, Northumberland Square, North Shields.

French Exports and Imports

The external electrical trade of France last year showed an increase in value compared with 1953 on both the import and export sides. Total exports of electrical machinery and material were valued at 47,000 million francs against 39,000 million francs in 1953, the greater part of the increase being attributable to larger sales to foreign countries; those to French possessions overseas progressed only slightly. The export total of 47,000 million francs compares with 19,400 million francs for imports, only a little more than in 1953.

Foreign countries which took more electrical material generally in 1954 were Switzerland, Belgo-Luxemburg, Netherlands, United Kingdom, Italy, Turkey and Sweden. The French statistics feature three main export groups, namely, generating plant, wire and cable, and radio apparatus. Exports of generating plant to foreign countries were valued at 5,400 million francs, an advance of about 12 per cent on 1953 and to French possessions overseas 3,900 million francs, a decline of about 20 per cent.

Exports of wire and cable rose sharply to 8,000 million francs against 4,500 million francs, due to more trade with foreign countries but not with French possessions. In radio apparatus, business also expanded and was valued at 2,700 million francs to foreign countries (or 50 per cent more than the 1953 figure) and 3,000 million francs to French possessions, a 30 per cent improvement.

Imports	1953 Million fr.	1954 Million fr.
Generating plant... ...	5,410	5,543
From West Germany	1,423	1,478
,, Switzerland ...	1,035	536
,, U.S.A.	889	1,061
,, Italy	727	1,116
,, Belgo-Luxemburg	636	551
,, U.K.	—	553
Radio apparatus	2,718	2,728
From U.S.A.	1,299	1,173
,, U.K.	216	520
,, Netherlands ...	401	473
,, West Germany	250	223
,, Switzerland ...	—	246

Leading foreign buyers of generating plant were Spain, the Netherlands, Belgo-Luxemburg, Argentina and West Germany; of wire and cable, Belgo-Luxemburg (nearly half the total) and the U.S.S.R.; and of radio apparatus, Switzerland, Belgo-Luxemburg and U.S.A. Radio exports were more than double imports.

The principal suppliers of electrical goods to France are shown in the accompanying table.

Australian Electrical Trade

Imports of dynamo-electrical machinery and electrical appliances and equipment into Australia during the September quarter of last year totalled £A7,550,000, an increase of about 15 per cent on the corresponding period of the previous year. Noteworthy among the increases were communication equipment (including radio) and heating and cooking appliances. The only outstanding decreases were in transformers and rectifiers and cable and wire. The accompanying table compares the values of the principal groups during the two quarters.

Imports	Sept. Quarter 1954 £A (000)	Inc. or dec. on Sept. Quarter 1953 £A (000)
Batteries and accumulators	85	— 14
Cable and wire, covered...	591	— 108
Communication equipment, including radio ...	1,106	+ 442
Electric motors	749	+ 130
Other dynamo-electric machines	1,222	— 54
Heating and cooking appliances	267	+ 192
Sparking plugs and parts...	171	+ 71
Other ignition equipment for i.c. engines... ...	81	+ 16
Lamps, bulbs, tubes, etc.	409	+ 150
Measuring and recording instruments	206	+ 80
Protective equipment ...	183	+ 60
Regulating, starting and controlling apparatus ...	1,150	+ 133
Transformers and rectifiers	612	— 433
Other electrical machinery and appliances ...	717	+ 314

Exports of dynamo-electric machinery and appliances and equipment totalled £A719,000 in value in the third quarter of 1954, compared with £A521,000 in the September quarter of the previous year. Batteries and accumulators accounted for £A111,000, against £A100,000, and communication equipment £A217,000 (£A134,000).

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 17th September.

CLECTROLLS. No. 742,529, Class 7, Electric washing machines. CLECTROLLS. No. 742,530, Class 9. Electric vacuum cleaners.—Cleaner-Homes, Ltd., 49-51, Crown Street, Reading, Berks.

AB-FI. No. 731,486, Class 9. Radio and television apparatus; sound recording, sound reproducing and sound amplifying instruments and apparatus; public address systems; and electric amplifiers, batteries, accumulators, microphones, loudspeakers, gramophones, gramophone pick-ups, turntables and high frequency electric oscillation generators; and parts.—Pamphonic Reproducers, Ltd., Radio Works, Cambridge.

CENTREX. No. 741,520, Class 9. Loudspeakers and electric transformers and parts.—Goodmans Industries, Ltd., Axiom Works, Lancelot Road, Wembley, Middlesex.

MUSILECTRIC. No. 741,529, Class 9. Electronic and electrical apparatus and instruments, and electrically-operated sound recording and sound reproducing apparatus.—J. E. Newman, 395, Pinner Road, Harrow, Middx.